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[Founded in 1849 as the "Journal of Gas Lighting."]

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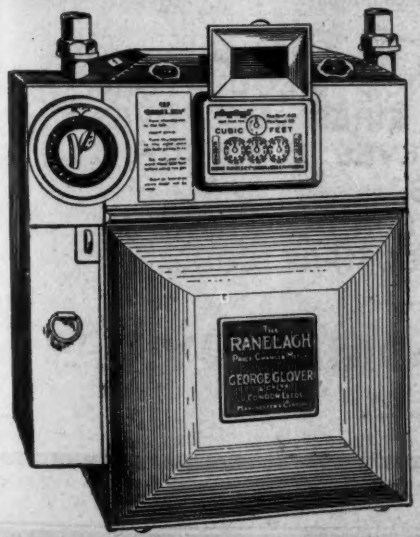

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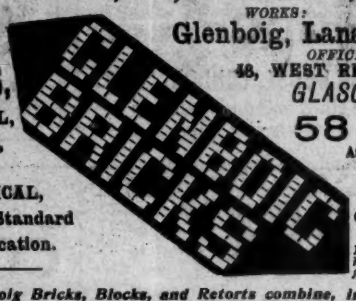

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VOL. CLXIV., No. 3152.] WEDNESDAY, OCTOBER 10, 1923. [75TH YEAR.

EDITORIAL NOTES.

Annual Conference of the "B.C.G.A."

It was an inspiration of the first order that associated the annual conference of the "B.C.G.A." with the National Gas Exhibition at Bingley Hall, Birmingham. It proved to be a happy and prosperous union. The members of the Association benefited from the exhibition; the exhibition from the members by their inspection of, and interest in, the display. And combined with this was the fact that the Birmingham City Council were largely identified with both the exhibition and the conference—the Rt. Hon. the Lord Mayor (Sir David Davis) being the President of the Exhibition, and the Chairman of the Gas Committee (Alderman J. H. Lloyd, M.A.) the President of the Association. Birmingham never does things by halves; and whatever the Corporation apply themselves to, they do with traditional fulness. It was so on this occasion; and it will always be so where gas is concerned—not only because Birmingham possesses the largest provincial gas undertaking, and is one of the most progressive, but because it feels that its associations with Murdoch during those days when he discovered gas and its virtues for lighting has entrusted to the Council certain obligations which it has been an ambition and a pleasure to fulfil. We have often wondered whether there was not some inspiring cause behind the unbroken willingness and readiness of the Corporation to place themselves and their works and experimental plant at the service of the industry for research and in other ways, and to help in all sorts of co-operative enterprise for its general benefit. Now the secret is out. Birmingham regards it as its duty to help to its utmost in the progress of that great work, the foundations of which were so well and truly laid by its "adopted son." There has been evidence of this again during recent weeks, and especially during the "B.C.G.A." conference, through the whole-hearted reception and hospitality of the Lord Mayor, the Corporation, and the Gas Committee. At appropriate occasions during the meeting, these high traditions of the city in good work and service were spoken of by the President of the National Gas Council (Mr. D. Milne Watson) and the President of the Institution of Gas Engineers (Mr. Samuel Tagg). Mr. F. W. Goodenough also told how he has found in Alderman Lloyd, during his year of office as President of the Association, traits that are typical of those of the leading citizens—whole-heartedness, efficiency, personal charm of manner, and sincerity. When all these considerations are added to the attractions of an excellent programme, there is no need to marvel that the attendance at this year's conference was so extraordinarily good.

For thirty-two years the President has been associated with the Gas Committee of the Birmingham Corporation; but while he has been impressed by the vastness of the work of the Department, and of the large interests of the gas industry, he admits that until he, as President, got behind the scenes in the work of the "B.C.G.A.," he had no clear conception as to the extent of the activities of the organization, or as to the amount of work its Executive Committee and staff are called upon to perform. We had this confession in the address; and taken in conjunction with the fact that the "B.C.G.A." has been the bridge over which the administrators of the gas industry have passed into the organized work of the industry, and which facilitated the formation of the National Gas Council, the Federation of Gas Employers, the Joint Industrial Council for the Industry, and certain commercial organizations dealing with secondary products, it is clear that the Association has rendered service far surpassing that which is its immediate *raison d'être*. But the President's confession of ignorance regarding the extent of the highways and by-ways of the normal work of the Association causes us once again to raise the question as to whether it would not be beneficial to the organization if there was less obscurity, so far as the members are concerned, as to the nature of the work to which there is not open reference. If something could be done in this way, we are confident that there would be less private discussion, when two and three are gathered together, as to how, and the purposes for which, money is expended in propaganda. It is all very well to say there should be trust in the Executive Committee. There is a large amount of trust; but there will always be those in a considerable body of men who contrast only what they see and hear with the aggregate of contributed money. Alderman Lloyd did not, even twelve months ago, know so much about the work of the Association as he knows to-day; and if this be the position of a man in his high and influential position, how much more is his case that of many other men? Said the President: "I never fully appreciated "all the splendid work the Association has done, and is "doing, until you honoured me by appointing me your "President, and I have been brought into contact with "every side of the Association's activities." Why should that knowledge not be that of every contributor to the funds of the Association? The information need not be printed or broadcasted in any way. There are always undesirable lookers-on and listeners-in. At the annual conference there could be a private sitting, at which the Executive Chairman could give a detailed account of the inner activities of the year; and this need not interfere with the report on general matters as now presented at the public meeting.

Like the President, we are satisfied the industry could not have progressed to the position it now occupies in public service if there had been no "B.C.G.A." or similar body. Progress, of course, is a matter of a combination of favourable conditions and activities. Reductions of the price of gas, improved efficiencies of appliances, and local propaganda efforts and methods of service, all have a part in the making of progress. But there is other work which can only be done by co-operation and specializing through a central body; and it is this work that the Association does well, and about which the President, keen man of business that he is, is so abundantly satisfied. It is due to the work of the Association—due to the cumulative influence of that work—with the contributory conditions to which we have alluded, that the gas industry in latter years has progressed so considerably. The President referred to the fact that the Birmingham Gas Department have now in use 170,000 cooking-stoves, 100,000 of which are in connection with the prepayment meter service; and it has also 64,500 gas-fire installations. Later in the conference was heard more as to the important industrial developments in the use of gas that have been effected in the Department's area of supply—in fact, some 30 p.ct. of the whole gas production is employed for industrial purposes in 180 different trades. More eloquent still were the figures supplied by Mr. Goodenough as to the advance of the gas industry during the four five-year periods of the past twenty years. There are two points about the remarkable data which he presented which strike us as being highly important and satisfactory. First, however, as to the figures, which were computed from

the Board of Trade returns relating to statutory gas undertakings; then as to the lessons. In the ten years ending 1912, the increase in gas sales was 45·6 thousand million cubic feet; in the ten years ending 1922, the increase upon 1912 was 60 thousand millions. Of the increase in the decade ending 1912, the ordinary consumers accounted for 10 thousand million cubic feet; and the prepayment consumers for 35·6 thousand million cubic feet. Of the increase in the decade ending with 1922, the ordinary consumers accounted for 31·3 thousand million cubic feet; and the prepayment consumers for 28·7 thousand million cubic feet. These figures are impressive as to advance, despite the keenest of competition. But mark this particularly—the increase in the five years ending 1922 was the greatest in any of the four five-year periods included in the compilation. This to us is a remarkable fact, because that quinquennium is the one in which we had the peak prices for gas! This shows that, though price is an important factor in progress, something else is operating in favour of gas; and that "something else" is the intrinsic value of gas, combined with the higher efficiency of use. The other point is that, while the prepayment sales in the last decade disclose a highly satisfactory increase, the advance in consumption by the ordinary customers made a tremendous bound upwards. This, we think, is largely due to three causes—the extension of domestic heating, the growing industrial and trade consumption, and the extending use of gas for water heating. This gives full justification for every penny that has been spent on propaganda work. And the continuation of that work is warranted by the presidential reference to the 35 million tons of coal still consumed in domestic open grates, to the millions of tons of coal used still in industry, and to the importance of the abatement of smoke to health and to the economies and amenities of life. It is good to be associated with an industry with such a large field in which to operate—not only to its own advantage, but to that of the community at large, and to national prosperity.

Thus it is that the work of the "B.C.G.A." must go on; and, if funds would allow, it would be possible to extend its beneficent operations and effects. Funds only limit them. But this is certain—that the Birmingham meeting and Alderman Lloyd's address will have done much to stabilize still more the organization in the propaganda system of an industry the prospects of which never presented themselves in larger or more tangible form than they do to-day. The successes of the recent past have, in our opinion, ensured an increased rate of materialization of those prospects.

Mr. Clynes on the Mutual Interests of Employers and Employed.

The best statesmen are those who can settle international difficulties without going to war; the best lawyers are those who make every effort to bring about a just settlement of difficulties between disputants without going the whole length of litigation; the best employers and labour leaders are those who make joint efforts to adjust troubles, when they unfortunately arise, without interrupting work and doing damage to the industry in which they are mutually concerned, and the prosperity of which means more employment. This is the common sense of the matter; and that common sense was well presented in the address which the Rt. Hon. J. R. Clynes, M.P., the President of the National Federation of General Workers, delivered to the members of the "B.C.G.A." after Alderman Lloyd's address. Mr. Clynes had a right good welcome from the large audience; and this was a recognition of a highly-placed record for good statesmanship in both the political and the labour worlds. The respected President of the Federation of General Workers has won his way to the front in the labour world—not by the policy of the extremist, but by that sound logic which can examine things from all points of view, which can give every man his due, and which helps one to get close to, if not wholly to attain, an objective without having recourse to action that would mean disaster to those whom it is a duty to serve. There are some people who think that action can only take one course; but the Federation of General Workers have time and again proved the contrary. Their first business is, while looking after the interests of their members, to maintain peace if at all possible; and this was well reflected in the address, which gained the encomiums of Sir Arthur Duckham and the applause of all present.

Right in the forefront of his address, Mr. Clynes assured his hearers that those whom he represented had a mutual interest in the general good conduct and development of the great gas industry. It is the recognition of this, we hold, that has paved the way for conditions in the industry that have made things far more pleasant and easier than is the case in certain other industries of which we all know; and for those conditions we are largely indebted to the good sense which prevails among the men's leaders and the representatives of the employers. Of course, the gas industry is somewhat different from other industries. So far as capital is concerned, dividends are regulated to a moderate amount; there can be no charge of profiteering. On the other hand, employment in it is fairly regular, having consideration for the changes between summer and winter—the peak of employment being in the months of greatest severity for many people. Having in view the constancy of employment for such a large number, pay cannot be regarded as at all bad; and pay is very generally supplemented by other conditions, apart from State aid, which the intelligent worker knows are for his benefit in sickness and in declining years. That is the position; and there is sufficient in it for contentment. Of course, troubles over details cannot be avoided where an army of men of different dispositions and ideas is concerned; but such troubles are mostly not difficult to negotiate and to bring to a settlement when confided to level-headed representatives of both parties. In all respects, then, there is good and extensive ground for that mutual interest, of which Mr. Clynes spoke, in co-operating for the well-being of the industry. The workers' leaders with whom the Federation of Gas Employers or the representatives of the employers on the Joint Industrial Council have to deal are as impressed with the importance to the workers of extending the scope of employment in such an industry, as they are with the importance of maintaining a just balance of conditions as between employers and employed. Mr. Clynes spoke of the interest he and his colleagues have in the promotion of the efficiency and the service of the industry by its organizations. They see this through the glasses of common sense. It is as abundantly clear to them as anything can be that increased efficiency—increased efficiency all round, from top to bottom of those who have part in the work of the industry, and through manufacturing plant and gas-consuming appliances—will lead to reductions of cost of the primary commodity, increase its use, and in the result call for a larger number of men to carry on the manifold work. To see these things, to help to maintain them, and to assist in expansion, all tend to promote the interests of the workers.

Mr. Clynes made a suggestion. He gave full credit to the work of the National Joint Industrial Council. This body, he agrees, has improved the spirit of co-operation between employers and employed. But he suggests that the continued use of this new method will require both sides to explore the question of whether remuneration should always be fixed in relation to some assumed standard of cost of living, or on a basis which would tend to raise the standard, and pay due regard to the value of the labour performed. This is a question for the Industrial Council. But as to paying the value of the labour performed, we have always been opposed to a too rigorous standardization of payment for work, as it has a tendency to place on the same plane the bad and the good worker, the inefficient and the efficient, the unconscientious and the conscientious; and in a sense the latter is always paying out something towards the maintenance of the former. Speaking only from our own view, and expressing only our own opinion, we are strongly inclined to payment on the basis of the value of the labour performed. It is the one just method.

All present at the meeting were glad to have had Mr. Clynes with them, and to have heard his address. It is good for the representatives of all the interests constituting the industry to get together. By such means better understandings are engendered, and better knowledge is gained of respective points of view. After hearing Mr. Clynes, one is struck very forcibly with the distinct parallelism that exists between the views and objectives of the representatives of the gas workers and of the employers. May that condition long continue!

The Papers Read.

We do not remember a conference of the "B.C.G.A." where the papers contributed to the proceedings have been so completely of the practical order as on this occasion. Their contents are such that they appeal not only to the

men of the gas industry, but to the public, and especially to men engaged in other industries and trades. With the exception of the contribution by Miss E. L. Willans, of the Gas Light and Coke Company, in which she spoke of gas service as an aid to, or rather as a necessity for, the housewife, the papers were all on the applications of gas in industry or trade; and the authors have direct experience of the described special uses in their districts. There are a few points bearing upon these industrial and trade papers upon which we have a little comment to make; but we will reserve it for our next issue.

Mantle Quality and the Lighting Load.

In our issue for the 12th ult., an editorial article appeared under the heading of "A Matter of Seconds." It referred to the importance of doing everything possible to maintain a high standard of mantles in this country. There has been much said in the gas industry lately as to a more general application of methods which will preserve the gas-lighting load; but while inferior quality and ill-shaped mantles are imported and distributed throughout the country, and British-made seconds of bad form are sold in retail shops, the difficulties of the task of improving matters with the view to protection are increased enormously. In the article referred to, it was pointed out that both the gas-supply industry and the British makers of mantles are mutually interested in this matter, and that their representative bodies should take counsel together to see whether anything can be done to eliminate this sale of poor-quality and badly-formed mantles, which are a big factor in the inefficiency found in so many places where gas lighting exists. Burner inspection and maintenance by gas suppliers would go a considerable distance to limit the market for these mantles, through the influence which gas undertakings would bring to bear upon consumers to buy only mantles which they could recommend. If the representatives of gas undertakings throughout the country and the British mantle manufacturers got together, we think they might devise some scheme which would be of mutual assistance, to repress the dumping into this country of types of mantles (which the industry knows full well will detrimentally affect its business) and the sale of throw-outs from the home factories. The mantle manufacturers are willing to meet representatives of the gas industry to discuss the matter. This is seen in a letter (published to-day in our "Correspondence" columns) from Mr. C. J. Healy, B.L., the Secretary of the Incandescent Mantle Manufacturers' Association. In the letter, he says the Committee of the Association have given consideration to the article in the "Journal" for Sept. 12; and he adds: "My Association fully appreciate the importance of main-"taining a high quality in gas mantles, and to secure this "object would be glad to meet the representatives of the "gas industry who are equally interested in the matter." This is a step towards an important goal. Remembering the big interests involved, will the next step be taken? We leave the matter there for the present, and shall await with interest information as to what, if anything, is done in the way of bringing about a conference.

The Regenerative Coal Gasification System.

An article of exceptional technical and practical interest on "The Regenerative Coal Gasification System" was commenced in our columns last week, and is concluded to-day. The authors are Dr. Morris W. Travers, F.R.S., and Mr. Frank W. Clark; and the value of their contribution lies not only in the fact that it describes a process for the complete gasification of coal which incorporates new features, but it states in detail the theory upon which the process is founded, and it shows that the theory is confirmed by the practical working of a 300,000 c.ft. per day plant—or gas-making "machine," the inventors prefer to call it—at the Aylesbury Gas Company's works, where it was adopted after a close investigation by the Engineer and Manager (Mr. A. G. Lane). The fact that the inventors refrained from publicity until they had available this working experience and endorsement of the theoretical premises and deductions that guided them in designing the plant, gives a completeness to the introduction of their new system to the gas profession. It must be acknowledged that the process has been, stage by stage, worked-out with scrupulous care; and due to this is the success that has attended (under the existing conditions and the coal in use) the operation of the first constructed example of the machine. There has been of late years a large amount of exploration into the problem of complete gasification; and cumulatively a higher thermal efficiency has been obtained. Now we have from this plant gas which approximates very closely to town gas in respect to the lowness of the percentage of incombustible constituents, with tar and ammonia only as the bye-products.

The problem which the inventors set themselves was a three-phase one. In brief, it may be stated as follows: (1) To gasify coal in a single process, producing as bye-products only tar, liquor, and ash containing a minimum of carbon. (2) To produce a gas having the qualities of town gas, and a relatively small proportion of inerts. (3) To carry out the process as efficiently as possible—that is to say, to realize the highest number of therms in gaseous fuel per ton of coal. The inventors have had experience of carbonization, water-gas, and producer-gas practice; and they applied this to the task of working-out a process of complete gasification, with the measure of success which has been set out in the article, and which is demonstrable by the Aylesbury machine. In considering the problem, they appear to have argued thus: The producer-gas process is the most efficient method for the production of gaseous fuel; but the product is unsuitable for use as town gas, owing to the high inert content and the consequent low calorific value of the gas. It is clear that the avoidance of the former would supplement the latter. That coal can be so efficiently gasified by the producer process is due to the fact that the whole of the sensible heat of the combustible gas, and of the nitrogen of the air used in the gasification work, is available to gasify the coal. Now Messrs. Travers and Clark make use of the same principle for town-gas production, but with an important variation in method. They cannot, to realize gas of low inert content, pass through the coal the blow gas in the modified water-gas process which they use, and so they make use of the sensible heat of it by means of a regenerative system—first heating chequer brickwork in a regenerator by the blow gas, and then carrying the heat from the regenerator directly to the coal by means of mixed water gas and distillation gas, which is circulated through the plant. Thus the heat (supplementing the sensible heat of the water gas) used to effect carbonization is waste heat recovered regeneratively; and this is (as already said) applied internally or directly to the coal. While there is an ample supply of heat available by this means, no more is expended than is required. The ideal condition in any carbonizing process is to use no more heat than is actually employed in the work; anything beyond is waste. To employ the first simile that comes to mind—to use more heat than is actually required for the purpose is like generating 10 h.p. in the cylinders of a motor-car engine, and using only 5 h.p. at the axle. Pursuing the analogy, the power—that is the heat energy—used in this gas-making machine is applied to the "axle" (the coal) direct. There we have tried to present in brief form the basic principle of the system, for which it is claimed that the thermal loss in gasifying the coal has been reduced to a very low point.

One feels inclined (but the compass of an editorial article does not allow of this) to dwell upon the details of this ingenious system, which, on first acquaintance, has a greater attraction about it even than a system which utilizes the heat of water gas internally and the heat of the blow gases from the water-gas plant externally, to effect the carbonization of the coal in a retort. When it is found that at Aylesbury gas is made of (say) an average of 370 B.Th.U., with about 12 p.ct. of inerts in it, and that on a dry-coal basis the production is of an order of 180 to 184 therms per ton, we can congratulate the Aylesbury Gas Company upon their enterprise, and the inventors of the system upon this first practical indication of their success. But there is further investigation to be made; and then a more detailed account of the working will, we hope, be forthcoming—in fact, this is promised in the article. Supplementary information is also required—and we understand will be available—as to running costs, about which all that can be said at present is that they are satisfactorily low, particularly so in regard to labour in relation to the output of therms per ton of coal. Details are wanting as to whether the process will work smoothly with all types of coal, and as to the output of tar and ammonia. These, too, will be presented in due course, as well as, we expect, particulars concerning the operation of

the plant in producing a gas enriched up to a declared calorific value.

Inquiry has been made into other important points—for instance, capital cost. Naturally, definite information as to this is not available for publication. But consideration of obvious facts leads to the conclusion that capital cost will be found to rank well among competing systems. It is manifest that the plant will not claim much ground space, and that small buildings only will be required to house it. In view of the fact that this is a complete gasification system, the storage space for materials will not be great. The quantity of coal to be handled is small in relation to gas make; and it has only to be handled once, and the total amount of refuse is not large. Therefore, the plant for handling materials will not mean a large expenditure. A related point is the cost of repairs. The six months' working experience at Aylesbury suggests that this will be low; but there is always doubt about accepting too early experiences in this connection. But there are two points which we may suggest will lead to a low cost of repairs. One is that it is only the small portion of the bottom of the generator that is exposed to a high temperature; and the other is that in this plant, the coal being heated directly by the hot gas, the refractory materials are actually at, and not above, the temperature of carbonization—in fact, the maximum temperature throughout the setting is 900° C. Consideration of these points leads one distinctly to the conclusion that Messrs. Travers and Clark's claim that repair costs will be moderate will be ratified by experience. In fact, the Aylesbury experience is already steadily building-up that ratification.

The new regenerative system of producing gas for town purposes is highly interesting—not only on account of the principles upon which it is designed, but because it is achieving the purpose which the inventors set out to realize, and about which more will be heard.

End of the Bingley Hall Exhibition.

The remarkably successful gas exhibition at Bingley Hall, Birmingham, came to an end last Wednesday, and ended fittingly with the annual meeting in the city of the British Commercial Gas Association, which supplied an opportunity for men of all ranks and interests in the gas industry to pay a visit to the fine display. The only matter for regret is that the period of the exhibition was all too short; but this was due to circumstances regarding Bingley Hall over which the promoters had no control. However, there is general satisfaction and praise. Everybody with whom we have come in contact who has recently been to Birmingham, or has had part in the display, has been pleased with what was seen, with what was done, and with the patronage by those concerned in the varied uses of gas, and by those identified in all ways with the propagation of those uses. The Lord Mayor of Birmingham (Alderman Sir David Davis) stated last week that the visitors had numbered upwards of 80,000. These came from all parts of the country. Some thousands of them represented the general public; and many of them will be—or must be if their minds are open to impressions—potential advertisers of gas. The pleasure of the visitors has been great; no less so has been that of the promoters and organizers of, and the workers for, the exhibition. The labour and energy that were expended by them, they regard as well rewarded by the result. This is particularly true when applied to those who have taken prominent part in it—the Chairman (Alderman Lloyd) and the members of the Birmingham Corporation Gas Committee, with Mr. A. W. Smith, Mr. R. J. Rogers, Mr. Ayre, and Mr. Whitehead, and the Midland gas undertakings and their officers generally. Those who contributed exhibits are also pleased; their enterprise is reaping a good reward. We are all in the same boat; and the boat is sailing along very well, considering the current circumstances associated with finance, industry, trade, and unemployment. Nevertheless, the exhibition was well timed; there being good hope that we are slowly but surely emerging from bad times and entering upon more prosperous ones. Now we have to follow up Birmingham with Wembley, and concentrate upon the organization of a meritorious display there next year. But the doors have only just been closed upon the exhibition in Bingley Hall. The days of its life were full; several events which will have an abiding interest are associated with it. It was all well done; and the programme was complete, and faithfully carried through. To all who contributed in any way to its rich success, the gas industry as a whole is grateful.

New President of the "B.C.G.A."

The new President of the "B.C.G.A." is Mr. H. Wade Deacon, J.P., Chairman of the Liverpool Gas Company. Long associated with this big Company, and well known for his progressive ideas and fidelity to the general interests of the gas industry, he will carry on the presidency of the Association with all the fervour that has marked the records of his predecessors in the chair. All being well, the annual conference next year will be held in Liverpool.

Thursday, Nov. 22.

This is a date for members of the Institution of Gas Engineers to enter in their diaries. On that day the Institution will be holding a session at the Public Works, Roads, and Transport Congress. The President (Mr. Samuel Tagg) is sure to be there; and papers are to be read by Mr. H. E. Bloor, on "The Quality and Composition of Town Gas," and Mr. Stephen Lacey, on "The Position of Mains in Public Highways."

The Smithells' Fund.

From the minutes of the Council meeting of the Institution of Gas Engineers, held on the 1st inst., it is seen that a report was made as to the subscriptions received for the Smithells' Testimonial Fund. Contributions, it was stated, are still coming in, and further amounts are anticipated.

When Mr. Chamberlain was Chairman.

Those visitors to the National Gas Exhibition, at Bingley Hall, Birmingham, who investigated the Historical Section, no doubt had pointed out to them a pocket-book which was the property of Mr. Joseph Chamberlain when he was Chairman of the Corporation Gas Committee, before the days when he became so eminent and took such a distinguished part in our national affairs. This pocket-book is a testimonial to the methodical manner in which Mr. Chamberlain performed all work which he undertook. Its pages also associate Mr. Charles Hunt with Mr. Chamberlain, when the former was one of the Engineers of the largest provincial gas undertaking. It was in Mr. Chamberlain's time that the first Gas Exhibition was held in Birmingham, and then, Mr. Hunt tells us, "we had a difficulty to fill the Lower Hall." That difficulty has passed. A very spacious place would be wanted to-day to illustrate all the applications of gas. Mr. Hunt, by the way, undertook the journey to Birmingham last Wednesday week, to see the good work at Bingley Hall in the way of present-day gas demonstration. If they could not do things so well nearly half-a-century ago, it was not due to the want of will, but to the absence of that progress which has since been effected.

A Woman's Tribute to Murdoch.

When Mr. Hunt was in Birmingham, Mr. A. W. Smith, the General Manager and Secretary of the Gas Department, told him of a pretty little incident that had taken place at the exhibition. In the Sulphate of Ammonia Federation exhibit near the main entrance, stood on a pedestal a bust of Murdoch. During the run of the exhibition, an elderly lady called at the office of the Executive Committee, and asked if there was any objection to her placing a bunch of pansies beneath the bust of Murdoch. Permission was given; and afterwards it was found that on a card attached to the flowers were these words: "Pansies for thoughts—from a woman—one of millions who are grateful for the boon of gas, and think kindly of its discoverer." This was a spontaneous act on the part of the lady; and Mr. Hunt, when mentioning the matter, remarked: "I really think this is a tribute to the gas industry which has followed Murdoch's ideal." It has not only followed, it has developed upon it; and no doubt if Murdoch were here to-day, he would be as proud of the men of the British gas industry as the gas industry is of him.

Murdoch's Cottage.

When in Scotland recently, Mr. P. C. Holmes Hunt—home for a period from Australia—visited Murdoch's Cottage. He was impressed by the condition into which it has fallen. At the dinner

given by the Birmingham Corporation Gas Committee to the members of the "B.C.G.A.," on Tuesday of last week, he expressed the hope that the gas industry would acquire the cottage, and preserve it.

The Education Scheme.

Modifications in the scheme, which have been found necessary to adapt it to Scottish conditions, are now under consideration.

Profits for the Rates.

The question of the transfer of profits from municipal trading undertakings to the relief of the rates was dealt with in a paper by Mr. John Allcock, the City Treasurer of Cardiff, at the meeting last week of the Society of Incorporated Accountants and Auditors. He advocated the adoption of the system recently inaugurated at Cardiff, under which the undertakings are expected to secure sufficient profits to enable a transfer of annual sums representing 1¼ p.ct. of the capital employed. Naturally we prefer a limited percentage to an unlimited one; but we distinctly deny the propriety of municipal undertakings giving any percentage of the profits in aid of the reduction of rates. It makes the customers of such undertakings super-rate payers; and therefore there is an inequitable incidence of the contribution to revenue for public purposes. Municipal undertakings should be run to provide the service at the lowest possible cost; and if there is a loss, and the ratepayers have to find the money, it should be regarded as only a temporary loan, and the charges should be adjusted to provide the money for repayment. The undertakings, and not the ratepayers, have to provide the money for interest, sinking fund, wear and tear, and depreciation; and they have to pay rates and taxes, and that heavily. Then why the additional tax in the way of a contribution to the relief of the rates?

It's an Ill Wind.

Gas salesmen, who are busy just now with gas-fires, will note that following on the cold snap last week the London coal merchants have clapped another 2s. and 1s. per ton (according to quality) on the price of coal. Reports of gas price reductions continue to come in, and so does information that the rates of increase in the fixing of gas-fires are being enlarged in many gas-supply areas.

The Miners' Agreement.

The Central Council of the Mining Association have refused to accede to the claim of the Miners' Federation for an alteration of the ratio of profits to wages, and an increase in the minimum wage to the percentage increase in the cost of living as compared with the 1914 rates of pay. On the third claim for fuller information as to costs of production other than wages, the reply is that already very full information is given, and fuller particulars would not serve any useful purpose. If there is any revision of the agreement, the coalowners intimate that they will themselves have to propose material alterations. The next step rests with the Miners' Federation. It has been decided by the Executive to consider the reply given by the coalowners at a special meeting in London on Oct. 17. The Executive will then determine whether they will call a national conference to decide the policy of the Federation towards the agreement. The national conference would not be called until November. Then, as the President of the Federation has definitely laid down that any notice to terminate the agreement can only be given as the result of a ballot vote of the men, such action could hardly be possible before the end of the year. Therefore, even in the event of the worst happening, there is no danger before March of next year. Should the result of the ballot be against the agreement, three months' notice has to be given before a stoppage can occur.

Increased Coal Output.

Last year the coal-mining industry suffered from the prevailing depression; but a notable advance was made in production, and in the later months the weekly output approached that of 1913. The total output during the twelve months amounted to 249,606,864 tons. This is the highest figure reached since 1916, and the output per person employed (217 tons) was the best since the seven-hour day became operative. There was a remarkable increase in the volume of coal exports. The fall in prices enabled British exporters to regain a footing in practically all the pre-war markets; and from April onwards, when the strike of coal miners in the United States began, Britain was reinstated in the supreme position in the overseas coal markets of the world. The total quantity of coal exported in 1922 (64,198,384 tons) exceeded that exported in 1921 by more than 39,500,000 tons, and was only 9,250,000 tons less than the "record" year, 1913. Unfortunately, the inland position was not nearly so satisfactory. By the end of the year, there was a slight improvement in the industrial demand; but this was obtained only by further reductions in prices. The total number of persons ordinarily employed at all mines in Great Britain and the Isle of Man during 1922 was 1,175,280. Of these 940,100 worked underground, and 235,180 above ground. Of the latter 6049 were females.

ELECTRICITY SUPPLY MEMORANDA.

A STRIKING feature in the work of some of our local governing bodies is the deplorable ignorance that exists regarding the relative merits of gas and electricity. This does not obtain merely with men whose knowlege is limited, but with men of higher education, who, at all events, might be expected to know something of the elementary facts relating to such matters, and who ought to make it their business to understand them if they wish to legislate properly in the interests of those whom they represent. We have, it would seem from a report in the "Shields Daily News," an instance at Tynemouth; and in the very few lines of the report, there seems to be a fine jumble of views. Councillor Lonie, who is one of the labour representatives, apparently advocates the use of electricity in schools on three grounds: First, that the electric light would be more healthy for the children; secondly, the light would be better; and, thirdly, its adoption would have "a bigger tendency to reduce the rates"—"bigger," apparently, than the use of gas supplied by the Tynemouth Gas Company. Then came Alderman Plummer, who is the Chairman of the Education Committee, and professionally an architect, in both of which capacities the possession of more than a superficial knowledge as to these matters is highly advantageous. He declares, the report alleges, that the Committee mean to have electricity substituted for gas. In one or two schools, they are doing so; but to do it all at once is a serious matter in respect of cost. However, they intend to carry on the substitution as far as their opportunities and finances will allow. Between Mr. Lonie and Alderman Plummer, the ratepayers are served-up with something that is both illogical and vague. Mr. Lonie omitted to tell those who heard him, and the public through the Press, why the electric light would be "more healthy" and "better" than gas; and Alderman Plummer's admission as to the seriousness of the cost of making the conversion from gas to electricity does not support Mr. Lonie's claim that the conversion will have a "big tendency" to reduce the rates. These are points which Alderman Plummer will find it hard to reconcile.

The Lighting of Schoolrooms.

Healthy Conditions.

Let us examine them, because they are important, particularly in schools. Mr. Lonie asserts that the electric light is more healthy and better; and he is one who is entrusted with participation in local government! We should like him to explain what he means by the statement. If he will do so, we shall be delighted to consider all he says, and discuss the matter further with him. Of course, artificial lighting is required very little in schools, other than on dark days, and just at the latter part of the afternoon in winter. It is a very thin business for electricity. But apart from this, we will consider the subject, and will give Mr. Lonie a basis for discussion. First, then, as to healthiness. Where there are a number of children congregated together in a school or class room, the impurity they throw-off during respiration is considerable. That is an undeniable fact. During the periods the gas-lights are going, a mechanical action is proceeding. Air is drawn up to the burners. The air in the lower part of the room is therefore caused to rise. The heated products of combustion from the burners continue the process; and if the thoughtful architect has provided a means of air egress in the upper part of the room, then a natural and inexpensive ventilating action is promoted which cannot be improved upon. What happens when electric lighting is in use? Instead of the lights assisting ventilation, they do absolutely nothing to cause air movement. Unless special ventilation is provided for, the air becomes stagnant. If Mr. Lonie will ask Alderman Plummer about this matter, assuming that gentleman has knowledge of physical laws of this kind, he will tell him that what is stated here is true, and that air movement in school-rooms (without draughts) is a more desirable condition than air stagnation. Now perhaps Mr. Lonie will tell us why electric light is more healthy than gas. Perhaps he is one of those gentlemen who have some idea that gas consumes the oxygen of the atmosphere, and leaves the rest of the constituent parts. Now when a burner draws in

air, it does not select the oxygen, and refuse to pass the remainder. What it does not need for combustion purposes, it ejects in a heated state; and this passes away through the simplest of ventilating openings at the top of the room—thus promoting the admission of fresh air at the lower part of the room. As an elementary scientific fact, it may interest Mr. Lonie and Alderman Plummer to know that, so long as any form of combustion can be supported in a room, there is ample oxygen for the human being. We are almost ashamed to occupy space in the "Journal" with such simple facts; but it is necessary when local councillors talk of health in relation to gas and electric lighting.

Less Suitability.

The next point is that Mr. Lonie coolly asserts that the electric light would be better than gas for the schools. Why does he say this? As a local councillor taking part in decisions on such matters, he ought to have a sound and substantial reason. Has he one? It is imperative that the eyes of children should be protected; and to protect them, they should not be exposed to a light of high intrinsic brilliancy. If Mr. Lonie does not know anything about the relative effects upon the eyesight of different ratios of light to the area of its source, then he is not even a tyro in the science of lighting, and therefore is not competent to judge as to which light is the better for the eyes of the children. Say a given amount of light is imparted from the almost invisible filaments of an electric incandescent lamp, and that the same amount of light is obtained from the large area of an incandescent gas mantle, the intrinsic brilliancy of the former is many times greater than that from the latter. Glare is admittedly wrong where the eyes are concerned; and with this all scientists and advanced electricians agree. Which, then, is the better light for the eyes of the children?

The Cost.

In order to protect the eyes of children from the noxious effects of electric lamp filaments, the lamps should be so shielded that no direct rays fall into the eyes. This protection costs extra money; and Alderman Plummer says that even the conversion from gas to electric light is a "serious matter." Despite the facts to which we have called attention, the Education Committee—the "Education" Committee, be it marked!—have made up their minds to proceed with these conversions so far as "opportunity and finances" will allow. The expense is a big one; the ratepayers have got to pay for it. Yet Mr. Lonie thinks the conversion will have a big tendency to reduce the rates. He is as much at sea there as in other matters. Alderman Plummer did not (if the report is reliable) take the trouble to deny the statement. The most modern incandescent gas-lamps could be installed at far less cost, and so save money for the ratepayers. Does Alderman Plummer, the Chairman of the Education Committee, know of these things? If so, why does he support an expenditure (that we hold is a waste) for the provision of a light which is less beneficial than that from efficient incandescent gas-burners? We fancy that at the bottom of the whole business is the fact that the electricity undertaking is a municipal concern; the gas supply is in the hands of private enterprise. In the olden days, one of the first principles in local government was "economy with efficiency." Since municipal authorities have become purveyors of electricity, that principle has been thrown to the winds. Now first and foremost is the idea that the electricity undertaking must be supported at all costs, even though the ratepayers pay dearly through some other channel—such as the lighting of schoolrooms, with all the attendant expense of making the conversion, and then securing something which is not so healthy, and which is harmful to the eyesight of children. Eyesight is a precious thing. Its injury is very costly to the nation; and it is not true statesmanship in the work of local government to increase costs in any direction that is not materially beneficial. When municipal trading contracts the broad view in local government, and when nescience rules, then ratepayers have good reason for regrets.

Low Percentage of Potential Lighting.

Mr. J. W. Beauchamp, the Director of the Electrical Development Association, has at the present time one great mission in life. He, like many other electrical engineers, is not satisfied with the progress that is being made in building-up the electric lighting load. Plans have been designed for, and methods without number have been applied to, the work of stimulating the increase of business in this line; and so now Mr. Beauchamp is preaching that something new should be tried to secure the long yearned-for success. He asserts that the percentage of the lighting business so far secured is really not very large. On this point, we have it from Mr. W. E. Bush, of the British Thomson-Houston Company, that only 15 p.ct. of the houses of this country are wired, probably less than 50 p.ct. of the factories, offices, shops, &c., and a small percentage of the streets and thoroughfares. These impressions and facts are gathered from Mr. Beauchamp's paper and the subsequent discussion at the opening in London of the Salesmen's Conferences for this session. While the percentage of the lighting business is not as yet very large, Mr. Beauchamp asks whether what has been obtained is due to salesmanship, and how much to the inherent virtue of the lighting. He omitted to ask how much of it is due to the attractions of novelty some few years ago, when the metallic filament lamp displaced the expensive and inefficient carbon filament lamp. He thinks that—no doubt he is right up to a point—the improvement in lamps, cheaper electricity, and a rising standard of comfort, have all led to the steady expansion of electric lighting, and "incidentally to a great increase in the number of small consumers." Judging from Mr. Bush's 15 p.ct. of the homes of the country, various meanings will be attributed to Mr. Beauchamp's "great increase." The responsible electrical engineer is not happy over the small consumer. Mr. Beauchamp admits this. There is, he says, a "general grumble" about the unremunerative character of much new lighting business. This is not to be wondered at, seeing that in small houses frequently the family spend most of their time in one room in which a single light suffices, and electric lamps have a higher efficiency, and so are lower consumers now, than aforetimes. But over this, Mr. Beauchamp bids the electrical engineer to take heart. His voice in the matter is that of the visionary, who has not yet probed the depths of human nature, and does not appreciate the important rôle that hard facts play in the decisions of householders. His view is that the lighting business must be regarded as the introduction to the promotion of general electrification in the home. The men of the gas industry know full well that the custom of many an occupant of a small house would not be worth having were it not for the use of a cooker and perhaps a gas-fire; and what is true of gas is true of electricity. But the applications of electricity have about them a swarm of difficulties, which intensify in degree as the pockets of householders become shallower. However, apparently Mr. Beauchamp's opinion is that, though the lighting business is not of a lucrative order, it should be obtained for its supposed advantage in securing custom in other domestic directions—at a lower price per unit!

Selling Light—Not Lamps or Energy.

Well now, it being admitted that the methods so far tried have not secured a very large proportion of the business in the lighting field, Mr. Beauchamp advocates trying the effect of something else on householders, shopkeepers, and others. He first suggests preaching among existing consumers the value of higher standards of illumination; for this will increase the load factor of lighting. But that is not the main point of his advocacy. What the electric salesman is advised to do is to realize the difference there is between selling light and selling lamps and energy, and to spread the conception that it is light that is being bought, and that light is the commodity the electricity supply undertakings have for sale. "If we teach people," said Mr. Beauchamp, "to buy light or illumination, and keep their minds more away from the actual cost of lamps, units, and wiring, we shall find an increasing dependence upon artificial light with advantage to all users." There we are afraid Mr. Beauchamp is setting the men of the electrical industry an insuperable task. However eloquent, all the talk in the world will not alter human nature; and the minds of people are not going to be detached from the costs of wiring, lamps, and electricity. With him we agree that "we want to secure a wider appreciation of the principles of good lighting, show people the advantage in comfort, efficiency, and even in the amenities of their leisure and play arising from the use of effective lighting." But the counsellor of the electric industry adds "and much more of it." Again we agree so long as the "much more" does not exceed requirement, because anything in excess of that is waste and uneconomical. Here Mr. Beauchamp departs from his usual courteous ways. He says that people will then find it does not pay to put 210-volt lamps on a 200-volt circuit because they last a little longer, or to skimp an installation and have a lighting service "only a little better than gas." That is unkind. Gas can give a "better" light than electricity at the same cost. We previously referred to the novelty that gained for electric lighting some vogue a number of years ago. Mr. Beauchamp claims that electric lighting gave "style" to the people and places employing it. To some extent he thinks this condition and view still exist; and he urges that electrical men must try very hard not to let electric lighting become commonplace too soon. Evidently the Director of the Electrical Development Association sees more difficulty ahead. Even style changes; and the public are learning more and more about those defects that are discreetly pushed behind the much paraded virtues.

Reports Held Over.—Among the matter which pressure has unfortunately compelled to be held over until the next issue of the "Journal" are reports of the meeting at Burnley last Saturday of the Manchester and District Junior Gas Association (at which Mr. J. H. Clegg delivered his Presidential Address), and of an inquiry on Friday by Mr. H. C. Honey, at the Offices of the Board of Trade, regarding an Order under the Gas Regulation Act for the Wolverhampton Gas Company.

Yorkshire Junior Gas Association.—As already intimated, the Association will open their new session on Saturday, Oct. 20. This will be the 21st annual general meeting; and it will take place at 3.15, in the Lecture Room of the Fuel Department of the Leeds University. After election of officers, the annual report and accounts will be submitted; and then Mr. W. B. M'Lusky, of Halifax, will address the members. Tea at the Victory Hotel, Briggate, and a smoking concert, will bring the proceedings to a close.

PERSONAL.

Dr. E. W. SMITH, F.I.C., who is a Director of Messrs. Woodall, Duckham and Jones (1920), Ltd., and of British Furnaces, Ltd., sailed on Wednesday, Oct. 3, on the "Empress of France" for America. Dr. Smith is due to give a lecture before the annual convention of the American Gas Association in New York on Oct. 17, and is to speak on "Experiences with the Therm in England."

One face was particularly missed from the annual conference of the "B.C.G.A." last week. Mr. W. M. MASON, the Manager of the Association, had the misfortune to be suddenly taken ill—the occasion of all occasions during the year when such a calamity would be deplored by him, and others. This indisposition prevented him being present at the meeting. Our last inquiry brought the information that Mr. Mason was better, but still not sufficiently well to leave home.

Colonel Sir EDWARD BROTHERTON, head of the well-known Yorkshire firm of Brotherton and Co., Ltd., chemical and explosives manufacturers, has promised £500 toward the equipment of a new bacteriological department for the Royal Bath Hospital, Harrogate. His offer will materialize as soon as the building (to cost £3000, of which £1200 has already been subscribed) is erected. Next year is the centenary of this charity, which is one of three hospitals in England specially devoted to the investigation and treatment of rheumatic diseases.

Sir ALAN HUTCHINGS, K.B.E. (Director of the South Yorkshire Chemical Works, Modern Transport Company, and North British and Mercantile Insurance Company (Local), has joined the Board of Benzol and By-Products.

Mr. J. A. DAVEY (Vice-President of the Yorkshire Coke Owners' Association, and formerly President of the Coke Oven Managers' Association) has been appointed General Manager of the above Company's colliery and works.

At a meeting of the Honley (near Huddersfield) Urban District Council last week, the seal of the Council was affixed to an address of congratulation to Mr. E. MESSENGER, Gas-Works Foreman and Assistant Manager, on his appointment to the position of Gas-Works Manager at Bungay (Suffolk). He has had twenty years' service at Honley.

NATIONAL GAS EXHIBITION.

BINGLEY HALL, BIRMINGHAM, SEPT. 17—OCT. 3.

[An account of the Exhibits was published in the Special Number issued on Sept. 19.]

On Tuesday afternoon of last week many of those attending the "B.C.G.A." Conference availed themselves of the opportunity to visit the Saltley, Nechells, and Windsor Street Gas-Works, the industrial research laboratories and chief showrooms, and the branch showrooms and distributing centres of the Birmingham gas undertaking.

SOME PRESENTATIONS.

A PLEASING CEREMONY.

On Wednesday morning, many of the exhibitors assembled in the Upper Annexe at Bingley Hall, under the presidency of Mr. D. M'Callum Gibb, to express their grateful appreciation of the assistance they had received from Mr. R. J. Rogers (the Hon. Secretary) and all who had been associated with him in the organization and administration of the exhibition.

The Chairman spoke of the untiring energy of Mr. Rogers in his work, and his unfailing courtesy—characteristics which were shared by all who had been associated with him in the work of the exhibition. On behalf of the exhibitors, he asked Mr. Rogers to accept a solid gold cigarette case, suitably inscribed, and an illuminated address handsomely framed. The address read as follows:—

Oct. 3, 1923.

NATIONAL GAS EXHIBITION.

At a representative meeting of exhibitors held this day, the following resolution was passed unanimously:—

"THAT the cordial thanks and heartiest congratulations be accorded Mr. R. J. Rogers for the sterling work, unfailing energy, and courtesy he has upon every occasion displayed in organizing the technical and secretarial direction of the above exhibition.

Not only has he given unsparing personal service in the cause of the gas industry, but the enthusiasm and interest with which he has so successfully instilled his staff has impressed the subscribers with unbounded admiration and gratitude.

It is desired in no small measure to testify to the great success which has attended Mr. Rogers' efforts, and to place upon permanent record the grateful appreciation and satisfaction, with the manifold benefits which the gas industry has received at his hands. It is further desired to express the confident hope that Mr. Rogers will for many years be given health and strength to carry on the good work, to which his record in the past bears such excellent testimony, on behalf of the industry to which his life has been devoted, and to express the heartiest wish that his efforts will be crowned with the success which he so richly deserves.

Signed by the Committee, on behalf of the contributors:

D. M'CALLUM GIBB	(Chairman of Committee), Director and General Manager, Parkinson Stove Company, Ltd.
J. A. MACLAY . .	R. & A. Main, Ltd.
A. AUSTIN	Cannon Iron Foundries.
W. H. LOCKE . .	General Gas Appliances, Ltd.
W. E. STEVENSON .	National Gas Engine Company, Ltd.
G. WILKES . . .	Parkinson Stove Company, Ltd.
E. STAMP	Thos. Glover and Main.

A diamond ring was presented to Mrs. Rogers.

Mr. Rogers, while expressing his appreciation of the gifts, gratefully recognized the loyal and unselfish way in which everyone in his Department had striven to make the exhibition a success. Mrs. Rogers also expressed her thanks.

Mr. G. M. Lewis and Mr. R. G. Marsh each received a silver cigarette case. To Mr. F. Ayre and Mr. A. W. Whitehead a wallet of notes was given.

MURDOCH LODGE.

With the particular object of affording the Masonic members of the British Commercial Gas Association an opportunity of meeting together, an Emergency Meeting of the Murdoch Lodge (No. 3480) was held last Wednesday at the Grand Hotel, Birmingham, when about 250 were present. The W.M. (W. Bro. W. M. Valon) presided. At the dinner which followed the initiation of Mr. Stanley J. Sadler, the toast of "The Grand Officers" was given by the S.W., W. Bro. R. J. Milbourne, J.P., P.P.G.P. (Salop), and was responded to by W. Bro. Sir W. H. Bowater. The toast of "The Provincial Grand Master and Provincial Grand Officers," proposed by the J.W., Bro. Lieut.-Col. W. R. Glover, C.M.G., D.S.O., was acknowledged by W. Bro. Swinden, Pro. G. S. Warwick. "The Worshipful Master" was submitted by W. Bro. Captain Robert Scott, I.P.M.; and Bro. R. J. Meiklejohn, I.G., gave that of "The Initiate." The D.C., W. Bro. S. O. Stephenson, Prov.G.S.D., proposed "The Visitors," which was replied to by Bro. A. W. Smith (General Manager and Secretary of the Birmingham Gas Department), and W. Bro. Harold E. Copp, of Hull. The toast of "The W.M.'s and Brethren of the Two Sister Lodges—the 'Evening Star' and the 'Northern Star,'" which was proposed from the Chair, was acknowledged by the respective Secretaries (W. Bro. W. T. Dunn, L.R., and Bro. Butterworth).

ECHOES FROM GAS EXHIBITIONS—PAST AND PRESENT.

By NORTON H. HUMPHRYS.

Of course, the "present" is the National Gas Exhibition, 1923, held at Bingley Hall, Birmingham. To one who has been personally associated with gas exhibitions since the date of their inception, and visited some hundreds, including all sorts and sizes ranging from the "national" undertakings at the Crystal Palace (1883), at Earl's Court (1904), and at the White City (1913), to the simple demonstration attended by a show of perhaps twenty appliances in charge of a single attendant in a country town, the past covers an enormous number of recollections, which do not include even a single instance of failure.

The exhibition has invariably proved a success. If a gas exhibition is not attended with satisfactory results, there is extraordinary mismanagement somewhere. In the following notes, the events of 1883 and 1904 will serve as representation of the past, and are selected as affording twenty year intervals. In view of utilitarian proclivities and demands on space, numerous remembrances relating to friends of long standing, now passed away, but leaving prominent results of their labours in the progress of our industry, must be rigorously cut out; and it would be idle to speculate at length on the reasons why an active and aggressive selling policy, the need for which was as evident in 1883 as it is to-day, was not more promptly and energetically taken-up by gas undertakings. The question was discussed in the Technical Press immediately after the close of the Crystal Palace exhibition, but went no further.

The fetish at that date was cheap gas; and methods that promised to reduce the manufacturing costs to the extent of 2d. or so per 1000 c.ft. received a warmer welcome. Many supposed that cheap gas would sell itself, and therefore a sales department was a useless expense; and such questions as the education of the consumer, or attention to his individual needs, were thought well covered by occasional demonstrations or exhibitions. Similar ideas are not uncommon to-day among the smaller class of gas undertakings. Managers or secretaries are seldom at fault. The chief hindrance is in the board room, and is due to the technical or commercial ignorance of those who hold the purse strings, and to the difficulty of inducing them to look further ahead than the prospects for the next dividend. The industry took a distinct step forward immediately eminent gas engineers began to move towards a seat at the board-room table or the president's chair.

Bingley Hall is a rectangular building, with galleries, having a spacious floor area and no obstructions other than supporting columns. The excellent facilities for general lay-out were recog-

nized and utilized to the full. Stalls clear of side walls were for the most part detached or semi-detached; and there were clear 6 ft. promenading spaces throughout, affording comfortable accommodation for a very large number of visitors at any one time, without crush or crowd. The original idea, at the early exhibitions, was the simple placing of goods on show in a straight row, as might be done by arranging them on shelves along a dead wall; but exhibitors have gradually developed a high degree of intelligence towards packing the available space to the best advantage. Many of the wall stalls were occupied on three sides, with an island in the centre, thus admitting an interior walk round. The detached stalls also had an inside walk; while the roof or ceiling was filled, when the goods were suitable for display in that position. One could not but admire the ingenuity that enabled a stock sufficient for a decent showroom to be laid out, without crowding, in such manner that every item could be readily examined.

With one or two exceptions, the leading firms were all in evidence; and we must not omit to observe that this was essentially a salesman's show—a fact that must not be lost sight of, when comparing it with previous national exhibitions. The works manager could find many objects of interest from his special point of view; but there was no attempt at a complete presentation of the manufacture, purification, storage, and distribution of gas. There was a clever combination of the popular with the practical element, in proper proportion, much assisted by absence of anything in the shape of "Section I.—Lighting: Section II.—Cooking," &c., which tends to enervation of the non-technical eye on reaching the twelfth or fourteenth item on a list of similar goods.

Personally, I have never met more homely, kindly people than at Birmingham; and an atmosphere of this nature seemed to have been infused throughout the whole of the arrangements. The attendants had a genial smile and courteous attention for all inquirers; and I should be greatly surprised to hear that even one of the thousands who passed the turnstiles at Bingley Hall had occasion to complain of neglect or inconvenience.

The first proceeding on entering the hall was to secure an official catalogue, look it through, and fix on a plan of campaign—which could be done in comfort in the well-appointed club room reserved for the use of exhibitors and gas officials. A modest 6d. was the charge for a substantial volume of over 200 pages octavo, exclusive of insets, clearly printed on good paper, and strongly bound, every page provided with a 2-in. margin for manuscript notes. There were ground plans, and complete indexes; and if the visitor did not promptly trace anything and everything that he wished to know, it was not the fault of the editor. Those who were so unfortunate as to be prevented from visiting Bingley Hall should, if possible, obtain a copy of this book, as, apart from the ostensible object, it is a useful means of reference that should not be absent from any gas-man's library. By courtesy of the Robbins Publishing Company, New York (publishers of the "Gas Age-Record"), I am furnished with their annual "Gas Engineering and Appliance Catalogue"—a well-arranged and illustrated volume comprising 330 pages, 12 in. by 9 in. Some idea of its comprehensiveness may be gathered from the fact that the classified list of products extends to 70 pages. There is difficulty in classifying and arranging the number of home trade lists and catalogues that come to hand in the course of a year, in such manner that any subject can be promptly turned-up; and I have often thought that a similar work on British lines would be valuable. The exhibition catalogue contains the nucleus of this, and may be preserved for that purpose, so far as appliances are concerned.

Something has been heard lately, even among those who ought to know better, to the effect that lighting by gas is a back-number. While the sales office should see there is no ground for complaint as to neglect of any department, a special word may be said for lighting, and that apart from sentiment attached to it as the first practical application of gas. As being in constant direct evidence, it is one of our best advertising lines. The installation of improved public lighting in the streets is invariably followed by increased business in the houses; and, as instanced in Birmingham, high-class street lighting is usually accompanied by a large consumption of gas per head of the population. If gas is effectually set-back in one direction, its prestige suffers in all others; and competitors who secure lighting business will not draw the line at that, but feel encouraged to utilize their success as a weapon for encroachment in other directions.

The extensive and really magnificent display of lighting at Birmingham goes to show that, if confidence in the future of gas lighting is weak in a few gas sales offices, the reproach does not apply to manufacturers of burners and appliances. The large flat-flame combinations and recuperative type burners that so successfully competed in the race for brilliant lighting effects in 1883 have passed over to the historical section, not because of diminution in the use of gas for lighting, but simply on account of developments and improvements. After rendering good service, they were replaced by upright type incandescent burners, which in turn gave way to the inverted and the high-pressure systems. High-power gas light was effectively evidenced by the lighting of the hall inside and out; and here it may be said that the visitor who did not pass an hour in walking round the leading thoroughfares of the city after dark, to study the public lighting arrangements, missed an item as important as any.

The exhibitor's stalls contained a most extensive assortment, starting from a profusion of small lights of the "Magna," "Midget," and "Peter Pan" type, proceeding to the bijou size of incandescent burner, and so on up to the highest powers. The small and hemispherical shape of mantle is stronger than the larger finger shape, which is important, not so much for saving on cost of mantles, as for minimizing annoyance and inconvenience attendant on replacements, and eliminating the objectionable broken mantle. A cluster has the advantage, as compared with a single burner, of spreading the source of light over a larger area, thus diminishing the sharpness of shadows, contrasts, and other objectionable effects of glare. Standing some distance away from a four-sided street lantern containing one universal mantle, and in such position that one of the ribs is directly interposed between the eye and the light, one gets the effect of a decided partial eclipse; the greater part of the light-yielding area being covered. But substitute a cluster of five smaller burners, and three of them will be directly visible. There was a large selection of ornamental coloured shades, in which beads and textile fabrics tended to displace the sanded, tinted, or painted glass that did duty in 1883. Excellent specimens of white light were also on view.

Gas fires and cookers retain nothing beyond the original skeleton, all details in the earlier patterns having been improved out of use. The plain iron box of our boyhood's day has been succeeded by ornamental castings, in which decoration has been carried to a degree far exceeding that applied to domestic fireplaces and kitchen ranges. One would like to have an idea of the extent to which appearance has assisted business. The present tendency is in the direction of a return to simplicity, to the avoidance of fillets, grooves, mouldings, and other facilities for accumulations of grease or dirt—and this without loss of pleasing appearance. A simple, yet well proportioned, design carries a tone of reliability and efficiency that is not conveyed by elaborate decoration.

The leading novelties in cookers are solid hot-plate burners, the disposal of supports in such manner that the maximum proportion of the heat goes to the kettle or saucepan, with minimum loss by conduction to the body of the stove, a regulating valve in the outlet flue, and thermostats of various types for securing constant oven temperature. Modern gas-fires are fitted with silent burners, self-supporting pillar fuel that requires no front bars, and efficient ventilation; and some patterns have circulating air arrangements for discharging a current of warm air into the apartment. If a boiling attachment is required, a side pedestal is preferred to a burner let into the casting on the top. A wide choice in mantels and surrounds is now available, so the gas-fire need no longer be a sort of excrescence in front of the fireplace, but can be built-in and rendered a tasteful adjunct to the general furnishing. A plain rectangular pattern, with flat surround flush with the wall or mantel, in a workshop or place of business leaves nothing to be desired; while artistic metallic finishes or majolica ware are available for decorative purposes, suitable to the best and most expensive environments.

The exhibition included an interesting historical section, comprising 120 items, of which Birmingham supplied no less than one-half. The extent to which the city is concerned with the early history of gas is generally known, but not fully appreciated; and as much may be said of the number of local firms who took part in the exhibition. Anything like a proper examination of the numerous documents, &c., could not be included within the limits of an ordinary visit—which suggests the possibility of permanently retaining this section entire, in some central locality, where it would be available for the instruction of the young, or for leisurely inspection by those who are personally interested.

In every department, the gas industry has increased in strength concurrently with increase in age. Some apparently promising appliances have disappeared, mostly on account of being improved out of existence. Others have withered through lack of encouragement owing to the established practice among gas undertakings of confining attention to articles of proved utility. With our numerous associations and committees, there is yet room for the encouragement of promising inventions. One occasionally meets with the growl that gas engineers are too conservative. To some extent the model form of accounts attached to the Gas-Works Clauses Act, 1871, is responsible for this state of things, because permanent capital cannot be loaded with the cost of experiments.

Perhaps the greater degree of enterprise on the part of manufacturers is due to the fact that they are not thus hampered. The exhibition is a standing proof that they do not regard the industry as having reached a period of decadence; and they deserve both congratulations and thanks from gas directors and managers, for their enterprise. The expenditure on the large number of stalls indicates a strong faith in the future, and the importance, magnitude, and stability of our industry. The exhibitors are shrewd business men who would not be likely to spend money for the benefit of a doubtful enterprise or a sinking ship. Let us hope that not one of them will have reason to regret his expenditure in connection with the National Gas Exhibition, 1923.

An hour at a magnificent cinema hall in the vicinity was an appropriate recreation, after "doing" the exhibition; because one of the items on the programme was a clever and amusing skit illustrating the convenience secured by a coin-change appendage to the ordinary "penny-in-the-slot" meter. It was an excellent example of modern advertising enterprise.

THE BRITISH COMMERCIAL GAS ASSOCIATION.

Twelfth Annual Conference at Birmingham.

IN the most auspicious circumstances the Twelfth Annual General Meeting and Conference of the British Commercial Gas Association was opened on Monday of last week at Birmingham, when a large number of the representatives of gas undertakings in the country, and members of the Birmingham City Council, attended a reception at the Council House in the evening, at the invitation of the Lord Mayor of Birmingham, Alderman Sir David Davis.

LIGHT AND LIFE.

Prior to the civic reception a lecture on "Light and Life" was delivered by Dr. C. W. SALEEBY, before a representative assembly. The chair was taken by Alderman John Henry Lloyd, who is Chairman of the Birmingham Gas Committee, and also the retiring President of the British Commercial Gas Association. He was supported by the Lord Mayor and Lady Mayoress, and several members of the Council of the Association.

Dr. Saleeby emphasized the importance of sunlight, and said there was an extraordinary promise of public health and happiness when sunshine was restored to what he described as this "over-urbanized and mal-urbanized country." A series of lantern slides was exhibited to show the extraordinary results achieved in America, Switzerland, Denmark, and England through the curative effect of sunlight in extreme cases of surgical tuberculosis and other diseases. What he had seen realized in Denmark, he added, had more than ever convinced him that to restore the sunlight to the lives of the people was the next great task of public health. If sunlight could cure diseases, why should not the light of day be turned on to the children of our towns and industrial centres and prevent their becoming ill? Many diseases would cease to exist by the application of sunlight, in the same way that hideous water-borne diseases had been abolished. Light was essential to the well-being of the community. For instance, rickets was simply a disease of darkness. Under the spell of sunlight it disappeared, as had been proved again and again. There were cities in England where the sunlight was rarely allowed to do its good work; but in the open countryside the evils of the unnatural darkness of the cities could be cured. It was of vital importance that people should keep sunlight playing about their lives as much as possible, and especially that it should be a part of the normal environment of young life.

Dr. Saleeby strongly protested against smoke being allowed to pervade the air, and thus shut out the sunlight. Referring to the proposed legislation in regard to the smoke nuisance, he said there was one serious defect in the new Bill, and this was its failure to deal with the domestic chimney, which was the cause of more than one half of the trouble. Without that provision it was merely playing with the question, and could not be regarded as a serious attempt to deal with the problem. When Parliament decreed that there should be no black smoke emitted from factory chimneys, the manufacturer overcame this very easily by contriving to make the smoke of the factory chimney brown, green, yellow—in fact, anything but black. A deputation of Sheffield manufacturers had protested to the Minister of Health against any legislation against smoke in the country. Their contention was that they would not know how to carry on industry in such a way as not to produce smoke. In Germany, however, said Dr. Saleeby, they could see produced without smoke the very same articles that were made at Sheffield; and it was for them to tell the Ministry of Health that, no matter what was said in Sheffield, smoke was not necessary. In conclusion, healthy human life demanded sunlight, fresh air, pure water, and simple food. He believed sunlight could be provided even in industrial centres. Civilization could be constructed so as to endure; but they must obey the laws of life.

The reception followed this address.

THE BUSINESS MEETING.

There was a very large attendance at the meeting which took place in the spacious lecture theatre of the Midland Institute on Tuesday morning.

The PRESIDENT (Alderman Lloyd) was supported by the Lord Mayor of Birmingham (Sir David Davis). Those present included the Rt. Hon. John R. Clynes, M.P., Mr. H. Wade Deacon (Chairman of the Liverpool Gas Company, and President-Elect of the "B.C.G.A."), Alderman Sir George E. Davies (Past-President of the "B.C.G.A."), Alderman F. S. Phillips (Chairman of the Borough of Salford Gas Committee), Messrs. Samuel Tagg (President of the Institution of Gas Engineers), F. C. Tilley (Chairman of the Society of British Gas Industries), A. W. Smith (General Manager and Secretary of the City of Birmingham Gas Department), F. W. Goodenough (Executive Chairman of the "B.C.G.A."), Sir Percy Stothert, K.B.E., Mr. Proctor (Chairman of the York Gas Company), Sir Frederick Mott, K.B.E., Mr. Percy Alden, Sir Arthur Duckham, K.C.B., Mrs. Cloudesley Brereton, and Dr. R. Clayton, M.P. (Widnes).

A WELCOME.

The LORD MAYOR, in welcoming the conference, said that many had obtained, through the medium of the National Gas Exhibition, a better appreciation of the manifold activities of the gas industry, and of its wonderful contribution towards the comfort of the people and the welfare of the nation. He was delighted to have the honour of welcoming the representatives of this great industry to Birmingham on the occasion of the annual conference of the British Commercial Gas Association. He understood that the Association represented what might be called the "customers' end" of the industry, and was a gas service association, linking together practically all the gas undertakings in the kingdom, and providing a central bureau of information and advice to which both consumers and gas managers might appeal. The necessity of bringing before the public the manifold uses to which gas was put in modern life had indeed been demonstrated by the Exhibition in Birmingham. He had heard the astonishment expressed during the past two weeks at the tremendous ramifications of the gas industry and the great advance in the application of gas and the construction of appliances. These conferences gave unrivalled opportunity for the exchange of views of experienced administrators of gas undertakings. He had often noticed in the Birmingham Press, at the end of some rather striking advertisement, those cryptic letters, "B.C.G.A.;" and many people in Birmingham thought this represented "Birmingham Corporation Gas Advertising." Their conference here, and the publicity given to their proceedings, would enlighten many of the public as to the true meaning of these initial letters. They were very proud of their long and honourable connection with the gas industry; and although, as members of the City Council, and as individual consumers, they occasionally criticized the Gas Department, either with regard to the price of gas, or in connection with the controversial subject of the relief of the rates, at the back of their minds they were proud of its splendid and progressive administration. The progress of the Department could be judged by the fact that the total output of gas per annum was now double that of twenty years ago, and nearly six times what it was when the Corporation took it over in 1875. This development was, of course, not peculiar to Birmingham; and he had been struck by the diagram which was exhibited in the gallery at the National Gas Exhibition, indicating the marvellous growth of the gas industry as a whole. The citizens of Birmingham had been fortunate in having found for its Gas Committee—ever since the acquirement of the undertaking by the Corporation—members of the Council who had spared neither time nor pains in building-up the successful Department they now possessed. Their President had always taken a keen interest in its work, and had served on its Committee for many years. In his opinion, it was singularly appropriate that he should have accepted the invitation to occupy the Presidential Chair.

ALDERMAN JOHN HENRY LLOYD, M.A.

Sir W. JOYNSON HICKS (Minister of Health) wrote: Dear Mr. Goodenough, I am afraid that it will not be possible for me to be in Birmingham at the beginning of October for the conference of the British Commercial Gas Association, for, as I am sure you will understand, my new duties are involving me in numerous engagements. I

do, however, most cordially wish the conference every success; and I may say that all endeavours to reduce, on sound lines, the pollution of the atmosphere by smoke and other noxious vapours have my fullest sympathy.

Lord ONSLOW (President of the Board of Education) wrote expressing his regret that he would not be able to be present at the conference, which he hoped would be most successful. He added that he had much sympathy with all well-conceived efforts to reduce the pollution of the atmosphere by smoke and other noxious vapours.

Mr. H. C. HONEY (Gas Administrator to the Board of Trade) wrote: I am very sorry that it will not be possible for me to attend the conference. I was, however, able to pay a short visit last week to the Gas Exhibition, and should like to congratulate all concerned upon the conspicuous success achieved.

The following cable from New York was read from Mr. OSCAR FOGG, on behalf of the American Gas Association:

> Please present fraternal greetings and good wishes American Gas Association to British Commercial Gas Association, and the hope that twelfth conference will mark even greater prosperity and progress in gas industry, Great Britain.—Fogg.

The PRESIDENT warmly acknowledged the generosity of the Lord Mayor, who had received the members of the Association at the Council House on the previous evening, and mentioned that the gathering was a very representative one, and included one engineer from Australia and several from Holland. They missed one face which they always expected to see at any gathering of the "B.C.G.A."—that of Mr. W. M. Mason. Unfortunately, he was prevented by illness from being there. Mr. Goodenough had drafted a telegram which it was suggested should be sent to Mr. Mason. This was as follows:

> "The President, Vice-Presidents, and members of the 'B.C.G.A.,' in annual meeting assembled, recognizing the devotion of Mr. Mason to the Association since its foundation, express great regret sudden illness and sincere hope for full and speedy recovery.—Goodenough, Chairman."

The conference approved this course.

The PRESIDENT (Alderman J. H. Lloyd, M.A. Chairman of the City of Birmingham Gas Committee) then delivered his

PRESIDENTIAL ADDRESS.

Had it not been for the upheaval caused by the war, Birmingham would have had the pleasure of welcoming the British Commercial Gas Association to its annual conference in 1915, when Sir Hallewell Rogers was President. This, however, was impossible; and it falls to my lot to have the privilege of addressing the "B.C.G.A." as their President in 1923.

My membership of the Birmingham Gas Committee extends over 32 years; and I may therefore claim a long acquaintance with the gas industry. I have watched with interest the many developments which have taken place in the administration of gas undertakings, and the extended activities of gas engineers, and all those associated with the profession, during that period. In no direction have these activities been more prominent than in the development of appliances for the use of gas, and the education of public opinion in connection with such use. To assist in this work, the British Commercial Gas Association was started eleven years ago. I must admit that, like most Englishmen, I have always been a little suspicious of anything that savoured too much of advertisement; and I never fully appreciated all the splendid work that the Association has done, and is doing, until you honoured me by appointing me your President, since when I have been brought into contact with every side of the Association's activities. I can only say that I am satisfied the industry could never have progressed to the position it now occupies in the public services if there had been no British Commercial Gas Association or some other similar body.

To those of you who have not yet been brought into close contact with the internal organization of the Association, I can give my assurance that your contributions to its funds represent money well invested, for which more than due return is given. When it is remembered that the total amount of our contributions from Birmingham, not only to the British Commercial Gas Association, but to the National Gas Council, the Federation of Gas Employers, and the Institution of Gas Engineers, does not represent the expenditure of a couple of three-halfpenny stamps per consumer per annum (the postage of two letters), I think you will agree that, for all the work which is being performed, and the service which is so readily available for the assistance of gas undertakings and their consumers, the cost is almost negligible. It is not necessary, however, to make any apology for the existence of the "B.C.G.A." But I should like to emphasize the fact that the setting-up of this Association was one of the first steps towards destroying the isolation and parochialism which I am afraid characterized the gas industry some twenty years ago; and it was, indeed, the first Association to draw together the administrators of gas undertakings as distinct from the technical engineers, and thus made more easily possible the formation of the National Gas Council, the Federation of Gas Employers, and the Joint Industrial Council for the Gas Industry, which bodies have done so much valuable work for every undertaking and its employees in the kingdom. I am sure it is particularly gratifying to all of us to see here to-day our friend Mr. Clynes, who has helped to build-up in the gas industry one of the best Joint Industrial Councils in the country, and whom we shall be delighted to hear upon a subject we all have at heart.

A BRITISH GAS ASSOCIATION.

The existence of the "B.C.G.A." has also brought about a better understanding with the traders in the gas industry, and has helped to bridge-over the old-time suspicion and distrust which existed. There is still some little overlapping among the various Associations which are in being; and, personally, I think that the time may come when we should follow the example of our gas friends in America, and set-up a British Gas Association, with its various sections, but with one homogeneous Head Council. There are still many prejudices to be destroyed before this desirable event takes place; but I hope that ere long the gas industry will be the fully united family I have indicated.

BIRMINGHAM AND THE INDUSTRY.

Well, you have honoured Birmingham, not only by appointing me your President, but by coming in such large numbers to this important conference; and I hope what we shall have to show you here, and the meetings which will be held in the course of the next few days, will justify your coming such long distances to attend what, I am afraid, is often considered a very dry affair by those of you who so frequently hear the same story told.

We are very proud in Birmingham of our intimate connection with the gas industry. The Corporation, in their administration of the gas undertaking, have always endeavoured to live up to the traditions of the past. Not only are we proud in being able to claim as one of Birmingham's adopted sons William Murdoch, the inventor of gas lighting, but we are also proud of our great citizen—Joseph Chamberlain—and the work he did in municipal reform, culminating in the purchase by the Corporation of the two gas companies which at one time operated in this district. The lines of organization and administration which were settled by Joseph Chamberlain during his chairmanship were based upon foundations—well and truly laid—upon which successive Gas Committees and officials have been able gradually to build-up the present great organization.

Those of you who visit the National Gas Exhibition (and I hope you will all do so) will see in the Historical Section a note-book containing voluminous notes in Mr. Chamberlain's own handwriting, which were compiled and used with such good effect in connection with the acquirement by the Corporation of the gas-works. You will be struck by the typically thorough manner in which he did this work, and you will appreciate the debt the Corporation, and his successors on the Gas Committee, owe him.

Those who had the honour of working under Mr. Chamberlain's chairmanship many years ago must have been inspired to emulate the keenness and thoroughness which were so characteristic of his life. It is pleasant to recall that we still have with us in the industry Mr. Charles Hunt, who was Engineer of one of the companies taken over by the Corporation in 1875-6. We have always had the good fortune of being served by an able and enthusiastic staff; and I like to think that this keenness and enthusiasm—which has been so especially prominent during the organization of the National Gas Exhibition here—is also traditional.

THE DEBT OF CIVILIZATION.

The gas industry has behind it a history of which it may justly be proud. I was particularly struck at the opening ceremony of the National Gas Exhibition by the remarks of Mr. Milne Watson regarding the debt that civilization to-day owes to Murdoch and those who followed him in the building-up the gas industry. It is a debt which, I am afraid, is not realized by the present generation. Apart from the marvellous manner in which coal-tar derivatives enter into medicinal and surgical science to-day, we must remember that the motor car was made possible by the invention of the internal-combustion engine, to which work our friend Sir Dugald Clerk contributed so wonderfully; that the motor-tyre industry would not have been commenced but for the solvent naphthas obtained from the distillation of coal tar; that extensive motoring has been made possible only by the application of refined tar to our roads; and that the motor industry therefore owes its important position to-day to the existence of the gas industry, and the pioneer work of its engineers and chemists. When one thinks also of the dyes, perfumes, and the thousands of other articles that owe their birth to the carbonization of coal on gas-works, one begins to realize how many of the amenities of our life to-day can be traced to Murdoch's wonderful work and to that of the enthusiasts who succeeded him.

The service of the gas industry to the community in other directions should, I think, be emphasized; the improvement of conditions in the home by the reduction of dirt and drudgery; the greater ease, speed, and certainty of cooking, which has meant so much to the working man and his wife, enabling the meals of the day to be so easily prepared, and contributing to health through the provision of properly-cooked food.

We have installed in Birmingham well over 100,000 cooking-stoves in connection with prepayment meters in artizan dwellings; and it can be realized what a boon these appliances are to the consumers. During the period of the recent coal dispute, the widespread use of such gas apparatus literally saved the lives and preserved the peace of the community here. Our average consumption of gas through prepayment meters in this city amounts to more than 25,000 c.ft. per consumer per annum.

The gas industry also provides cheap, efficient, and safe lighting, which has practically eliminated oil-lamp fatalities in the homes of the masses, where they at one time wrought havoc, while providing the housewife with the same advantage as the oil

lamp—namely, warmth in the chilly dark evenings. The installation of gas-fires and gas-heated water appliances in the homes has in many households helped to solve the domestic servant problem. In our industrial life the installation of gas appliances in factories has improved materially the working conditions, by reducing the heat and labour attending the firing of furnaces and other apparatus.

Last, but by no means least, the gas industry, and particularly this Association, by its activities, is helping to improve the health of the community by the abatement of the smoke nuisance. In this direction, I am confident that the value of our work will increase during the next few years. The national conscience is rapidly being awakened to the necessity of dealing with the conservation of our fuel resources, and the removal of the smoke evil. I have myself been struck by the impressive display on the "B.C.G.A." exhibit in Bingley Hall, illustrating the enormous waste involved in the burning every year of 35 million tons of coal in open domestic grates in this country; and last night we heard the other side of the story in eloquent, moving, and convincing words from Dr. Saleeby, on the effect of the smoke curse.

I am sure all will rejoice that legislative proposals are now before Parliament for the abatement of this evil; and though some of us may regret that the proposals are not of a more far-reaching character, it must be remembered that Parliament cannot wisely go much, if at all, in advance of public opinion in such a matter. It therefore behoves us, both through the Association and in our own districts, to do all in our power to inform the public upon this vital subject; not only so, but to endeavour to cheapen the price of the alternative fuel we recommend, in order that the public may have a financial incentive to adopt gas, or the smokeless fuel provided by our coke, for heating their homes.

Notwithstanding that there are thousands of derivatives from coal and its residuals, we know there are still unexplored possibilities yet to be discovered in the coal which the Creator has placed at our disposal, and which the public is so wastefully using at the present time.

HELP OF THE "B.C.G.A."

In what way is the "B.C.G.A." helping to increase the use of gas in our homes and in our works, and so to bring about the results that I have briefly indicated, and which we shall all agree are highly desirable and worth the expenditure of a good deal of money to achieve? The answer is, first of all, by doing the work to which I have just referred as so necessary—namely, that of informing the public mind upon the many possibilities for the use of gas, both for domestic and industrial purposes, and the advantages accruing therefrom to the public in their several capacities as consumers, ratepayers, and citizens. In other words, by advertising—using this word in its fullest sense of "giving information," and not merely with the limited meaning usually attached to it of printed announcements more or less attractively displayed in the public Press, on the hoardings, and elsewhere.

The "B.C.G.A." is not merely an organization for co-operative press advertising; it is an organization for the information and education of the public in all practicable ways as to the advantage, to citizens as individuals, and to the community as a whole, of utilizing the nation's diminishing coal supplies by resolving the coal into all its useful component parts at gas-works, instead of burning it in primitive fashion, and so destroying much of its potential value and defiling the atmosphere in the process. It is also an organization for assisting every individual gas undertaking to carry out this work of information and education locally; and, further, it includes in its programme the constant consideration and discussion of the best possible means for giving to the public the most efficient service that can be organized in connection with the supply of gas, and with the provision and maintenance of appliances suited for its utilization. Members have only to turn, in the Exhibition Catalogue, to the description of the "Sales Department Section" of the Association, and to visit the exhibit organized by its officials, to realize the extent of the service which the organization has to offer to the industry under this heading alone.

A further direction in which the Association is able to effect the education of the public on matters relating to gas is through the supply of material to writers for (or the editors of) textbooks, handbooks, year-books, and other works of reference used by the professional classes, by students, and by the public generally. We no longer, as at first, have to offer such service—we are now constantly asked to give it; and it is difficult to over-estimate the value of the service rendered to the gas industry by the substitution of correct and up-to-date for erroneous or out-of-date information in such publications.

I cannot pass from the subject of national propaganda work without referring to the valuable service done by the publication of the work "Teachers' Notes for Lessons on the Manufacture, Distribution, and Use of Gas," which has been widely circulated among our schools by many undertakings, and cordially welcomed by science and other teachers. Nor must I omit to mention the annual "Fairy Gas" Competition, which, to an increasing degree every year, creates interest in gas among tens of thousands of school children and their parents and friends, and adds to their knowledge of its properties, uses, and advantages. The Association, in helping to familiarize the rising generation with gas and its many uses, is laying sure foundations for the future growth and prosperity of the industry and the cheapening of gas to the public.

The Association also, in addition to all the service thus rendered to the industry as a whole, offers, and gives in increasing volume every year, to the individual subscribing undertakings assistance in the carrying out of local propaganda work. This is done by the preparation and supply of literature of all kinds for distribution and display, including that invaluable periodical "A Thousand-and-One Uses for Gas;" of copy, blocks, form letters, and ideas for local advertising campaigns; of articles for local publication; of cinematograph films, lectures, and lantern slides for local use; and of material and ideas for showroom displays and local exhibitions.

I am very pleased to be associated with an industry that has such a wide field of work before it for the public welfare, and am proud to have had the honour of acting as President of an Association which, by educative efforts and propaganda, has done so much to direct attention to the evils that result from the present wasteful methods of consuming coal. When I hand my mantle over to the gentleman who will succeed me as President, I can only hope he will have as inspiring and instructive a year of office as I have had.

The spirit which animates the British Commercial Gas Association should animate all those responsible for the administration of gas undertakings—in the full assurance that they are recommending what will tend to conserve our country's coal, thereby husbanding the nation's natural resources; to render the atmosphere purer, thus beneficially affecting the health of the people; to provide facilities decreasing drudgery in the home, thereby increasing human happiness; and to raise the level of efficiency in industry, thereby adding to the nation's prosperity.

MR. CLYNES ADDRESSES THE CONFERENCE.

The Right Hon. J. R. Clynes, M.P. (President of the National Federation of General Workers), next addressed the conference. He entirely agreed, he said, with the remarks of the Lord Mayor of Birmingham regarding the extreme usefulness of the Gas Exhibition, which was not altogether unconnected with the conference. "I bid you prosper," he added, "and go on, especially in the matter of carrying into the homes of the poorer people the great advantages which have already been accomplished through the enterprise in conferring better and cheaper facilities in the way of cooking and heating in the homes of the poor."

He congratulated them upon having shown that the Association was capable of conferring a large measure of good upon all who were related to the gas industry, at a cost so trifling that those concerned could scarcely feel it. He assured them that those he represented had a mutual interest in the general good conduct and development of this great industry. He was in a position to speak to them especially in relation to the human factor, and to put forward what he thought might be regarded as reasonable claims on behalf of the manual workers in the industry. He conceded that among other conditions for the success of the industry three must find a permanent place: (1) The level of general national prosperity; (2) efficiency and output from the joint energies of those concerned in the industry; and (3) the maintenance of peace in the industry, and the spread of goodwill. He did not think he was putting the claim too high when he said that the relationship between employed and employer which had been developed in the gas industry was as good as was to be found in any of the principal industries of the country; and he would claim, too, that the men's leaders were not unknown for reasonable and conciliatory methods when the adjustment of difficulties arose. In the earlier years, separate agreements had to be made in respect of the various districts, but gradually area standards were brought out and particular rates were fixed, having regard to the size of works and the equipment employed. This called into being the National Joint Industrial Council. On the employers' side were included representatives of corporation gas committees and privately owned gas-works; and on the men's side representatives from trade unions which had gas-workers in their membership. The Council operated through eleven Regional Councils, who had, in the aggregate, 100,000 gas-workers in their keeping. This Council had improved the spirit of co-operation between employers and employed; but the continued use of this new method would require both sides to explore the question of whether remuneration should always be fixed in relation to some assumed standard of the cost of living, or on a basis which would tend to raise this standard and pay due regard to the value of the labour performed. The Whitley Councils were conceived in the right spirit; but most of their work had been done under abnormal conditions during, and since, the war. The gas industry was subject to seasonal changes and to new methods of production; and these conditions greatly increased the necessity for the management and the men to work together for mutual advantage. If, however, on the part of the men, there was ever an inclination to shirk, there was now no room for it; and if ever on the part of the management there was a tendency to oppress, they would be restrained by the fact that oppression was certain to be resisted. On the whole, the gas industry had been less subjected to disputes and stoppages of work than some others; and the better use of the Whitley Councils might well increase this good fortune. Convictions and principles in relation to a social order or to the basis on which industry generally ought to be conducted need not be forfeited by either side in the endeavour of both sides to make the best for the time being of existing conditions. Co-operation for immediate good results was nothing more than the application and practice of the quality of common sense, of which in private life everyone claimed to possess a share. The employers in gas manufacture could be certain of a greater degree of co-operation if they were willing to pay the price for it in affording their men the best conditions which the industry would allow; but the best could be assured only in exchange for the best effort of the workmen employed.

Mr. Clynes then criticized the pre-war attitude respecting the pay of workmen, the nature of which could only result in a growing revolt. He pointed out that neglect of the human factor had been a fruitful

source of trouble, and said that perhaps the biggest blunder which most employers had committed had been that of seldom yielding what they could afford to give except under pressure of the workman's power to compel. No system of under-production could be tolerated. "Real wealth," he said, "can only be expressed in terms of work, and whatever else may be sought as a solution for present-day difficulties, at least two things are essential. One is that employers should try to secure the confidence of their workpeople in exploiting industry, and the other is to conduct their business so as to avoid lowering standards of output, which immediately causes an increase in cost, which, in turn, at once tends to diminish opportunities for employment, by raising the price of the goods produced." Passing on to the question of unemployment, Mr. Clynes said he believed that enormous sums of money had been wasted in relief payment to masses of workers, without exchange for any service. They should see to it that they never gave away anything for nothing. He supposed the total cost of unemployment now, from relief agencies, unemployment insurance, and additional bodies providing support would not be less than £2,000,000 a week. They must try to make fuller use of internal resources, for it was clear that for a long time they must carry the burden of trade depression, and must turn more and more to their internal capacity. They must develop on more scientific lines. There should be more comprehensive insurance for unemployment relief, but not on an industrial basis. The management of insurance could be administered honourably, yet strictly and humanely, by making fuller use of the joint supervision and services of workmen's and employers' associations. The outlook must still be regarded as grave and disturbing. In spite of the grim conditions and great hardships that had had to be endured by millions of the people in the last few years, it was a matter for congratulation that a state of general internal peace had been maintained. There was something in the British character which he thought would see this thing through, and they would be helped to that end more speedily by a greater concentration of the qualities of common sense and a desire for co-operative effort.

Sir PERCY STOTHERT proposed a vote of thanks to Mr. Clynes for his frank and eloquent address. He had instanced the splendid work which had been done by the Council of the Industry since its inception, and had referred with satisfaction to the peace that had existed between gas undertakings and their workmen during the last few years. In his opinion there were several reasons for this. One was that the municipally-owned gas-works distributed their profits among the ratepayers. He hoped in any future Bills careful watch would be kept to prevent these profits being distributed among other departments to bolster-up their deficient accounts. With regard to privately-owned concerns, there was generally a stipulation that they should only pay, at the most, a moderate dividend; and he hoped it would be recognized by consumers that there was no desire to make all possible profit. ["Hear, hear."]

Sir ARTHUR DUCKHAM seconded the resolution, and observed that they had listened to an extremely fine speech, which was of special industrial interest. It would have the effect of sending employers back to their works fully determined to improve matters—if this were necessary. Mr. Clynes had brought out what was best in trade unionism.

The resolution was carried unanimously.

Mr. CLYNES, in reply, mentioned that two or three years ago, having said what he thought on the questions of output and on the general subject of a fair day's work for a fair day's pay, he was criticized, and in some quarters condemned. In Birmingham a large conference, not of trade-union officials but of workmen direct from their different places of labour, had assembled. They listened to reasons and arguments, and when they understood, when they were convinced by the weight of argument, that under-production was a loss to themselves, they unanimously supported the public views he had expressed.

Mr. J. H. ELLIS (Chairman of the Plymouth and Stonehouse Gas Light and Coke Company) moved a vote of thanks to Alderman Lloyd for his address, which bore the evidence of thought and finish, and for his work as President during the past year. No one could have listened to what he had said without appreciating the advantages the Association had derived from his presence. Discussing points raised in Mr. Clynes' address, he observed that they believed in good faith and good work. They could not have good work or success with idleness. Alderman Lloyd had been an ideal President, for he had a spirit which was as great as it was lovable. The Association could not always expect to have so distinguished and excellent a President, but a gentleman had been chosen to succeed the Alderman as President who he believed would worthily fulfil the high traditions of the office.

Mr. S. TAGG (Preston) seconded the resolution, and spoke of the high traditions of Birmingham from the point of view of the gas industry, and added that, when the name of Alderman Lloyd was first mentioned, they felt they would have in him a man who would give inspiration to the work of the Association. Their anticipations had been more than fulfilled.

The resolution was approved with enthusiasm.

Alderman LLOYD, acknowledging the compliment, said it had been a pleasure to do anything he could in furtherance of the work of the Association. He was sure that all in Birmingham were glad to have the opportunity of welcoming the members to that city. They had been told in an address during the meeting that they were to be frank; and, though he did not propose to go into the question, he felt he ought to say, in reply to Sir Percy Stothert, that he did not think it was exactly the duty of the companies who got their dividends, fees, and emoluments to criticize municipalities as to the way in which they might expend their balance of profit.

ANNUAL REPORT.

Mr. F. W. GOODENOUGH (Executive Chairman), proposing the adoption of the twelfth annual report and statement of accounts, asked the members to be guided, when making their estimate of the work of the Association, not merely by the record of the past year, good as this was, but to let their review cover an extended period. A study of the sales of gas during the past twenty years provided a complete and most encouraging refutation of the idea that the gas industry was stagnating or, as some would have them believe, moribund. Did not some member of the London County Council, not distantly associated with municipal electricity supply, recently put on record his idea that gas would not be used in our homes in ten years' time? He fancied that this member's opinion was the child of his wish rather than of his knowledge; for what ground for this opinion could he find in the following, based upon the Board of Trade official figures?

Sales of Gas 1902-1922.—In Thousands of Millions of Cubic Feet.

	Gas Sold.			Increase in Five Years.			Increase in Ten Years.		
Year.	By Ordinary Meters.	By Automatic Meters.*	Total.	Ordinary.	Automatic.	Total.	Ordinary.	Automatic.	Total.
1902	145·2	14·3	159·5						
1907	149·9	31·5	181·4	4·7	17·2	21·9			
1912	155·2	49·9	205·1	5·3	18·4	23·7	10·0	35·6	45·6
1917	169·5	63·0	232·5	14·3	13·1	27·4			
1922	186·5	78·6	265·1	17·0	15·6	32·6	31·3	28·7	60·0
				41·3	64·3	105·6			

* Estimated on the basis of 15,000 c.ft. per automatic meter per annum, 1902–17,
18,000 " " " " " " 1922.

What did these figures show? A larger total increase every five years—*i.e.*, the increase in 1922 over 1917 was the greatest in any of the four five-year periods; that in 1917 over 1912 was greater than that in 1912 over 1907, and this in its turn was greater than 1907 over 1902. The increase in the decade 1913-22 was 60,000 millions, as compared with 45,600 millions in the preceding ten years; and if the sales to ordinary consumers were considered as those which were most affected by progressive policy and propaganda, it would be seen that the increase in the last ten years (31,300 millions) was more than three times as great as in 1903-12. The increase in sales to ordinary consumers in the ten years represented three times the total output of Birmingham.

The progress of the gas industry had been continuous; and one could claim that it had been due to the increasing degree with which a progressive policy had been pursued. This had been embodied in the work for the industry by the British Commercial Gas Association. The progress made was in ratio to the support that had been forthcoming from the various gas undertakings; and there was every reason to say that, as the scale of support from the industry ascended, they endeavoured to give a rising scale of service. Ten years ago they were supported by 250 undertakings. Now it was three times this number. Some comment had been made on the fact that £34,000 had been spent in carrying on the work of the Association during the year. It was true that this was a large sum; but the gas industry was a large industry, and when they considered the amount that was spent on publicity by some of the huge commercial houses of the country, it would be seen that the sum was comparatively very small indeed. He thought the expenditure had been thoroughly justified, having regard to the substantial increase which had been made in the consumption of gas for all purposes. The Executive, however, were far from satisfied with what had been done. There was infinitely more to accomplish. The field of possible development was by no means exhausted. The Executive recognized that they had made mistakes. They appreciated their shortcomings; but with the assistance of the members they would try to benefit by their mistakes. The Association had before them one very big task, which was that of devising a good scheme of education on the commercial side of the industry. The past years had been devoted by the industry largely to expenditure on plant and appliances; but in future they should turn their attention more than ever to the human side of the industry. They had to remember that the industry was represented to the public by its outdoor representatives; and up to now sufficient had not been done to educate and train the sales staff. In the past the necessity of having the right type of man to represent the industry to the public was not sufficiently realized; and money would have to be found to train the staff. The Executive would not rest until they had brought their work under the scheme to fruition. In commending the report to the meeting, Mr. Goodenough added that the record was of value only as a stimulus to them to better work in the future, which was full of promise. If all the members were prepared to play their part, he believed yet more substantial advance would be made.

Alderman F. S. PHILLIPS (Salford), in seconding the resolution, observed that during the past year there had been a good addition of strength. At present the Association was not supported by all the gas undertakings of the country; and he thought that much good would result if steps were taken to point out to those who were not directly identified with them how great were the advantages of being connected with the Association. There was a real advantage in having one united and compact body carrying-on the work. It was an extraordinary fact that even to-day there was a widespread idea that gas was "going," not "coming." Personally, whenever the occasion occurred, he took the opportunity to combat this stupid idea; but it would appear that a great deal of work was necessary to remove the impression. His hope was that the Association would continue its beneficent work, not the least important aspect of which was that concerned with the improvement of the health of the people by lessening the smoke evil.

Alderman VINT (Sunderland) supported the resolution. He had watched, he said, the growth of the Association, and was able to appreciate the great results achieved. The present conference was in itself evidence of this progress. He believed he was right in saying that it was the biggest meeting they had ever had. He desired to add a word of appreciation of the work of the Executive, and hoped a tribute to their services would be made by the conference.

Mr. F. C. TILLEY (Chairman of the Society of British Gas Industries) also supported the resolution. He pointed out that he was on

the manufacturing side of the industry, which made apparatus and plant; and on behalf of the manufacturers he desired to say how greatly they appreciated the work of the Association. He hoped no one would think that it did not have their deepest consideration. Manufacturers of plant were faced with a good deal of competition from outside; and therefore there was a limit to their resources, and the amount they could contribute. He thought he could say that the manufacturers would do all they could for the Association.

Friendly greetings were conveyed to the conference by Mr. O. S. KNOTTNERUS (Holland), President of the Dutch Gas Association.

Mr. CARR said he believed there was scope for great propaganda work with regard to the uses of gas for manufacturing purposes. He hoped the Executive would give this matter close attention.

Mr. GOODENOUGH said that activity of the kind mentioned necessarily depended upon the amount of funds available. Much had been done to provide local undertakings with material for approaching every industry in their districts by the publication of "A Thousand-and-One Uses for Gas." They had found this to be fruitful in results. They distributed it freely in his district. He thought the Executive were doing more than was realized in this direction.

The report was approved.

THE NEW PRESIDENT.

The PRESIDENT announced the result of the ballot, which recorded the unanimous election of Mr. H. Wade Deacon (Chairman of the Liverpool Gas Company) as President of the Association for the coming year, and the election of Messrs. Cash, Stone, & Co. as Auditors.

Mr. DEACON, in reply, said he greatly appreciated the honour. When invited to accept it he had felt a great deal of diffidence, because he was doubtful whether he would be able to fill the position to their satisfaction, for he recognized how well the duties had been discharged by Alderman Lloyd. He hoped the Association would do him and his colleagues the honour of coming next year to Liverpool.

The CHAIRMAN said that he had pleasure in accepting this invitation.

TUESDAY'S LUNCHEON.

There was a large and representative attendance at the luncheon given by the Birmingham Gas Department at Bingley Hall on Tuesday, at which Alderman LLOYD presided, supported by members of the Gas Committee and of the "B.C.G.A."

Mr. H. W. RUSSELL BENCRAFT, who proposed the toast of "The British Commercial Gas Association," observed that the Association was founded, organized, and fed by the gas industry. It was in effect a new department of the industry—its co-operative sales, organization, and information bureau, as well as its co-operative propaganda department. The motto "All for one and one for all" was a fine ideal; and they were thankful for any organization that gave them a high standard for their work. They believed that the work of the Association was of great benefit to the citizens of Birmingham, and to those of every other city and town which supported them. Gas consumers, domestic and industrial; employees of gas departments; ratepayers; householders of all standings; manufacturers; and citizens in their personal capacity—all benefited. They believed this because the Association's work was all designed—and the design in his judgment was executed with skill and success—directly or indirectly to increase the use of gas for domestic and industrial purposes. Such increased use tended to reduce the price to the consumer, to maintain and increase employment at gas-works, to increase the revenue to the rates from a growing industry, to improve the conditions in the home by the reduction of dirt and drudgery, to expedite, improve, increase, and cheapen output in the factories, and to improve the health of towns and cities by the abatement of the smoke nuisance—an evil which polluted the atmosphere and obscured the beneficent rays of the sun. The gas industry, he concluded, asked for a fair field and no favour. In speaking of the relative values of gas and electricity, he said that gas had no desire to stand in the way of progress; but the latter was not necessarily achieved by the displacement of the older by the newer. Each had its field, and there was room for both gas and electricity. He warmly acknowledged the work of the Chairman, and that of Mr. Mason, Mr. Walker, and Mrs. Cloudesley Brereton.

Alderman LLOYD, in reply, observed that they were keen for the progress of the gas industry, and realized the importance of the organization. He had hoped to see Mr. William Gibbons, who was the only living Director of the old South Staffordshire Gas Company, which had been taken over by the Birmingham Corporation.

Mr. GOODENOUGH, in proposing the toast "The Officers of the Birmingham Corporation Gas Department," acknowledged their public-spirited work.

Mr. A. W. SMITH, with whose name the toast was coupled, replied, testifying to the keen interest taken by the whole of the staff to make the event a success. It represented team work, and the team had responded loyally and willingly.

After the luncheon the members proceeded to an inspection of the Exhibition, and to pay other visits to works, showrooms, and demonstration shops of the Corporation, while some others attended the meeting addressed by Sir Frederick Mott, and others.

GAS SERVICE AND DOMESTIC ECONOMY.

The chair at the session of the conference devoted to the subject of "Gas as an Aid to Domestic Economy" was taken by Sir Frederick MOTT, K.B.E., M.D., F.R.C.P., F.R.S., who said that there was one branch of domestic economy and science in which, as a physiologist, a social pyschologist, and a physician, he had been particularly interested—the science and art of cooking.

There was an important distinction, said Sir Frederick, between the "science" and the "art" of cookery. The science meant a thorough knowledge of the chemistry of cooked and uncooked foods; and it was a subject that had to be learned. Not so the art; but the latter was, he said, the more essential of the two. Fortunately, the Diploma in domestic science at the London University, among others, could not be taken without a thorough knowledge of both. In the elementary and secondary schools, moreover, both in London and Birmingham, experience in the art of cooking wholesome and tasty meals, in bread baking, and in cake making, was afforded by the classes which treated these vital subjects as a part of domestic economy. Sir Frederick said that in a number of visits to these schools he had been greatly impressed by the zeal of the teachers and the interest which they inspired in the girls. English women had the reputation of being wasteful and unintelligent cooks, as compared with French women; but the proper instruction of schoolgirls would, he felt sure, go far to remedy this, while the simplicity of cooking by gas and the possibilities of the utilization of gas through automatic meters in the homes of the poor would certainly enable children to apply in their homes knowledge acquired in the schools. The reduction in the price of gas was also materially assisting these ends.

Gas Service as an Aid to the Housewife.

By Miss E. L. WILLANS, Principal, Women's Advisory Staff, Gas Light and Coke Company.

First let me say that the designation of this paper is, in my opinion, incomplete, I might almost say incorrect. Gas service is more than an aid, it is a necessity to every housewife. Gas service gives comfort and leisure to the housewife—comfort in that, with an efficient and up-to-date gas service, you have all the blessings of a constant or intermittent hot-water supply at any hour. The earliest of early morning baths is no worry in the house fitted with a circulator or geyser; and shaving water can always be had at a moment's notice. In cases of illness, too, hot water is immediately available. Many of us have, on such occasions, experienced the necessity for hot water at a moment's notice, and have chafed at the time taken to boil a kettle of water in a house where there is no gas service. Think of the many illnesses of children which can be quickly alleviated by warm baths. During the period of domestic upheaval known as spring cleaning, the value of a gas water-heater is evident, enabling any quantity of water to be obtained at once. For the housewife it means less work, strain, and worry, and for the husband a shorter period of banishment.

Have you ever experienced the comfort of radiators in your corridors, of gas-fires in your bedrooms? Going to bed—and even getting up—is a pleasure in a house where the bedrooms have gas-fires. The coldest night or morning has no terrors; and in modern households where domestic help is hard to secure, the installation of gas-fires, in addition to cookers and water heaters already mentioned, goes a long way to solve the problem. In illness, especially where an even temperature is required, comforting heat, which can be easily regulated and kept stable, is obtained with a gas-fire.

Domestic conditions have been revolutionized by the introduction of labour-saving devices in the home, which owe their existence to gas. Gas equipment can do more for the poor man's wife than the beauty specialist can do for the rich man's lady.

One reads in novels of the "soft glow of the lamp light." In practice it is usually the smell of the lamp that affects me most. It is then that one thinks longingly of the snug little home, with its gas-cooker, cheery gas-fires, and its restful gas-light. The only objection to gas-fires that I can see is that you cannot hammer them with the poker when you get cross. On the other hand, if everyone had gas-fires there would be far less cause for bad tempers or irritated nerves.

Let us turn for a moment to wash day. Those of you who may have used the old-fashioned copper, may also remember the trouble connected with it—how at one moment the fire would blaze up fiercely, and clothes and water boil over—and later, if left to its own devices, would go out. Then there was the difficulty of emptying the copper, and drying it so that the clothes did not iron-mould, and, covering all, the clouds of steam that penetrated even to the front door. What a difference with that little gas-copper! You light the gas just when you want it, and regulate the burner to suit your requirements. The lid fits, and the steam is carried away through a special vent pipe; and the odour of washing is confined to the inside of the copper and to the chimney. How easy it is to empty with its draw-off tap, and how simple to clean with its enamelled interior! So many of us are compelled to do a great deal of laundry work at home, which at the best is something of a trial; but there is no question that a gas-copper lessens the worries of washing day in a way not to be believed by those who have not used one.

Then there is that other most useful little device, the gas airer and drier. It is compact, and will fit into the smallest space. Another very helpful improvement is the gas-iron. Ladies, think of the miles you walk in a year to and from the stove with your ordinary iron; and of the time wasted in waiting for the irons to get hot, or to cool down. With a gas-iron you can start right away and go on until everything is finished; and the heat can be regulated to a nicety for all kinds of ironing. For the busy housewife who undertakes home laundry these things are invaluable from the point of view of labour saving; while for economy they are unsurpassed. How many people know of that excellent device, a gas-incinerator, which, with a trifling consumption of

gas, completely destroys the rubbish that breeds the germs responsible for so many of the ills of mankind?

I should like to say, though in doing so I risk indignant protest, that most cases of complaint of inefficiency in gas-apparatus are really due to lack of knowledge of how to use them; and this is particularly applicable to the gas-cooker. The Company whom I have the honour to serve have recognized this fact, and employ a staff of fifteen trained experts who spend their time explaining away the difficulties the inexperienced housewife has with her gas-cooker. They are quite small things in some cases, but are none the less irritating. However, the trained expert can easily prove that the gas-cooker is what it should be in the matter of efficiency. Such simple things as not heating the oven long enough, or using tins too large, are small in themselves, but annoying in their effects. One of the members of my staff called on a lady who complained that the joint was still raw after being in the oven three hours. Was it to be wondered at when she had lighted all the burners on the hotplate, put the joint in the oven, and left the door open?

So far we have dealt only with the personal and private advantages which gas offers. Now let us turn for a moment to the larger benefits which the use of gas affords to the community in general. If gas were used more extensively in our cities, many grey days would become bright, and bright days would become brighter. The day of "pea soup" fogs is fast passing, but we still suffer from a less pungent variety. Think of the soot deposited everywhere from domestic chimneys, and which we are breathing into our lungs. Most of us have experienced the air of our manufacturing towns, where there always seems to be a heavy cloud overhead. Can one wonder that people get depressed, and less able to resist disease in such an atmosphere? Does not everyone remember the clarity and brightness of the period of the coal strike, when the feeling of oppression was lifted so that one felt that there was some compensation even for what was almost a national calamity? If only from the point of view of the health of the community, we should do our utmost to reduce the amount of solid fuel used, and to prevent smoke pouring out from our chimneys.

Another factor which should make the housewife favour gas is its reliability. It is not affected by atmospheric conditions; whether it is a windy day or not makes no difference to the capacity of your gas-cooker to cook, or your gas-fire to warm.

In conclusion, I would say that gas used with care will be found to be an inestimable boon to the housewife. Its many advantages and usefulness I have described to the best of my ability; but it is only by experience that these advantages can be fully realized. If you would save yourself an infinite amount of time, trouble, and expense in the future, give yourself more leisure and comfort, and a greater chance of happiness, and, last but not least, do your bit to conserve the nation's treasure and to benefit the health of the general public, the way lies open before you—the way of gas.

Sir ARTHUR DUCKHAM, in proposing a vote of thanks to Miss Willans for her address, said he had never had any coal in his house. He believed in an all-gas house. The only objection he experienced was that one did not get the same service when one went from home. If the fittings became out of order, it was an easy matter to get in touch with the gas department. Gas concerns were always pleased to give them help. He insisted that gas was cheaper than any other form of heating; and it was a mystery to him that so many housewives were content to use coal-fires.

An interesting discussion followed.

DINNER TO THE CONFERENCE.

The Birmingham Gas Committee entertained the members of the conference to dinner at the Grand Hotel, Birmingham, on the Tuesday, when the Grosvenor Room was thronged. The PRESIDENT (Alderman Lloyd) was in the chair; and the representative company included the Lord Mayor and Lady Mayoress of Birmingham, Sir Hallewell Rogers (formerly Chairman of the Birmingham Gas Committee), Alderman Sir David Brooks, the members of the Birmingham Gas Committee, Sir Arthur Duckham, Mr. P. J. H. Hannon, M.P., Sir George Davies (Immediate Past-President of the British Commercial Gas Association), and Mr. F. H. C. Wiltshire (Town Clerk of Birmingham). A message was received from the Lord Mayor of Manchester and Sir William Kay regretting that they were unable to come to Birmingham. From the chair, the Loyal Toast was honoured.

The toast "The Gas Industry" was submitted by Mr. HANNON, M.P. He said its expansion had been most remarkable; its foundation and evolution belonged to the region of romance. It had been distinguished by remarkable enterprise, which commanded unstinted admiration; and to no industry had brain power of more progressive quality been applied. No industry in our time had contributed so materially to human comfort and happiness and the advancement of constructive enterprise in the nation itself. He paid tribute to all those splendid members of the industry who responded to the call of the nation to serve in the cause of liberty, prepared to lay down their lives in that time of trial. In Birmingham, 1239 of the officials and workmen of the department at once joined the Colours, and 158 laid down their lives. What was true of Birmingham was equally true of the industry throughout the country. Some 30 p.ct. of the whole of Birmingham's gas production was employed for industrial purposes in 180 different trades. There were 1260 different varieties of small industries in the city. The efficiency of these enterprises would not be what it was if it had not been for the gas industry's providing power at a reasonable cost. A great spirit of enterprise had characterized the Birmingham Gas Department. The work done by the Research Department had aroused considerable interest in the gas industry. It was now being followed by some departments. There were 200,000 gas consumers in Birmingham; and of these, 105,000 were users by means of the prepayment-meter system. The number of gas-cookers in use was 170,000; and there were 64,500 gas fire installations. Could they conceive the measure of comfort which such provision by the gas industry conferred on the great mass of the population? The organizations connected with the gas industry were admirably managed; and in this connection he specially mentioned the sterling work of Mr. F. W. Goodenough, whom he described as a great driving force, and Mr. Milne Watson.

Mr. MILNE WATSON, in acknowledging the toast, warmly congratulated Birmingham upon the great success of the Exhibition; it had done a splendid national work. He had never seen an exhibition more complete with gas appliances and equipment. "We owe a great debt of gratitude to Birmingham," he added, "which has always led in the matter of industrial gas-appliances." ["Hear, hear."] Gas was being used to an increasing extent in all the great cities—particularly in the industrial towns; and it was their ambition that ultimately a gas-fire should be installed in every house. He believed that the outlook of the industry was better than at any time before. He trusted that what they had done in Birmingham they would do again, to help the National Gas Council and the British Commercial Gas Association, at the British Empire Exhibition at Wembley; so that the effect of their educational work might extend overseas. "I hope," he concluded, "the gas industry as a whole will rally round the Committee who have been formed, and whose desire is to make that exhibition even better than the Birmingham one."

Response was also made by Mr. P. C. HOLMES HUNT, who spoke of the progress made by the gas industry in Australia. The Commonwealth had only a population equal to London. How much better purpose would be served to the Empire by the expenditure of a great portion of the money now expended in doles on peopling the open and distant countries, and so strengthening the Empire! ["Hear, hear."] The gas industry there was forging ahead. It was in a strong condition; and the demand for gas was great. There were men in the gas industry in Australia with names familiar to many of those present, who were carrying the banner of gas in no uncertain fashion. In Queensland there was Mr. Broadhead, who had made good at Brisbane, and who had much on hand. In Sydney, there was Mr. Moreland, of the North Shore Company, a name well known on this side. Mr. Moreland went out as Engineer to the Company, and was now Chairman. Many of them were acquainted with Mr. Andrew Wilson, of Sydney, also. Then there was Mr. Reeson, of Beckton fame, in Melbourne; and, in Adelaide, Mr. Durkin, whose father's name many would recollect in connection with Southampton. He (Mr. Hunt) had the pleasure of meeting all these gentlemen and many others, in the gas industry, shortly before he left Australia; and he was asked to convey to the industry in Great Britain a message of goodwill and friendship. And apart from those of them who had gone out to the gas industry in Australia, the industry there had also, he was delighted to tell them, many able men, Australian born, both on the secretarial and technical side, who had made good in their respective positions, and whom, he was quite sure, many of the engineers and secretaries in Britain would be only too glad to know. Among the names which came to him at the moment were Mr. Gurnett, Mr. O'Dea, and Mr. Tindale. He was much impressed by the scheme of education brought out by the Institution of Gas Engineers, and hoped that the gas undertakings would give every encouragement to their young employees to become students. Sufficient regard should also be paid to the question of remuneration. He had visited Murdoch's cottage, and was hopeful that the industry would secure the building and preserve it.

Alderman Sir GEORGE DAVIES (Bristol) proposed "The City of Birmingham." He warmly acknowledged the generosity of the Lord Mayor, and the enterprise and excellent management shown by the Gas Committee with regard to the Exhibition. The propaganda side had been admirably brought out. Birmingham, it would appear, repudiated that it was a modern city, and pointed to the fact that its history dated back to Anglo-Saxon times. He did not think, however, that Birmingham was much concerned with delightful memories. It was a great and prosperous city, and this was largely due to the activity and vigour of its citizens. There was evidence that Birmingham knew that continued prosperity depended upon the work of to-day, and what would grow out of it. Everywhere there was evidence of public spirit and patriotism. Bristol regarded Birmingham with peculiar interest, and was hopeful that the latter would consider Bristol the natural port to which they would direct their trade. The gas industry greatly appreciated what Birmingham had done to make the visit of the Association thoroughly successful. (Applause.)

The LORD MAYOR OF BIRMINGHAM, in reply, expressed the belief that the introduction of electricity was partly responsible for the great success of the gas industry. There was need for both; and the healthy competition of electricity had served as a stimulus. He hoped the conference would be fruitful of good results.

The sittings of the conference were resumed at the Midland Institute on Wednesday morning, when the following papers were read:

(1) "Practical Advantages of Gas Service to the Manufacturer." By Mr. A. W. SMITH, of Birmingham.

(2) "Heat-Treatment by Gas in Midland Industries." By Dr. C. M. WALTER, of Birmingham.

(3) "The Use of Gas in the Boot and Shoe Industry." By Mr. G. S. EUNSON, of Northampton.

GAS IN INDUSTRY.

The Practical Advantages of Gas Service to the Manufacturer.

By A. W. Smith, General Manager and Secretary, City of Birmingham Gas Department.

The author first detailed the experience which decided the Birmingham Corporation Gas Department to widen the scope of the Industrial Gas Section, and to create what has developed in effect into a local National Physical Laboratory. In addition to industrial showrooms and practical demonstration rooms fully equipped with gas-furnaces, in which manufacturers are able to carry out any tests they may require on a practical scale, and obtain figures of costs, &c., a suite of laboratories is available in which the manufacturer can have any tests of a chemical, metallurgical, or engineering nature carried out as required. The staff employed have necessarily to be highly trained and specially qualified representatives, who have full and theoretical training in the many varied processes which are met with in Birmingham. It is obviously essential that any advice given, especially of such a nature, has to have commercial value. A large amount of confidential work has been carried out in these laboratories, and many advances in all kinds of manufactories have been evolved and developed by the staff under Dr. C. M. Walter, who, since he left the Birmingham University, has been employed solely in connection with the utilization of gas for industrial purposes, and who, as Engineer-in-Charge of the Industrial Research Laboratories, has done so much to further the use of gas and to win the confidence of the manufacturers with whom he has been brought into contact.

Pointing to the fact that the initial price of the manufacturers' fuel is by no means the only factor to be taken into account when reckoning up the advantages to be gained, the author remarked that many of the benefits offered by gas are, of course, difficult of evaluation; and the circumstances of every manufacturer's case may have to be calculated differently. Briefly summarized, however, gas for heating purposes in manufacturing processes offers the following important advantages:

1.—The general cleanliness both of the apparatus itself and its immediate surroundings.
2.—Simplicity of control. (Fuel handling is reduced to the turning of a tap, and almost foolproof control is obtained. The gas-oven furnace lends itself to control by the pyrometer more than any other form of furnace.)
3.—High speed of working. (Heats can be obtained quickly, and retained with greater ease.)
4.—A high degree of cleanliness of the work produced.
5.—Saving of space by the elimination of fuel storage.
6.—Saving of labour charges in the handling of solid fuel and resultant ashes
7.—Absence of smoke, resulting in greater comfort and health of the workpeople employed.
8.—The ease with which manufacturing costs can be dissected by separate metering of the gas consumed in different sections.
9.—The advantages of being able to tap the knowledge and experience of, and receive advice from, the gas undertakings' specially trained staff in any difficulties which the manufacturer may encounter.

It is, of course, impossible for every gas undertaking to equip laboratories and employ such a staff as in Birmingham; but this is where the British Commercial Gas Association step in and provide an admirable channel through which the experience and knowledge of the larger gas undertakings can be made available to the smallest concern, and, through them, to their consumers. It is not necessary to urge to this audience the desirability of the manager of every gas undertaking, however small, utilizing to the full the opportunities for service offered by the "B.C.G.A." Lack of good gas service in any district reflects, not only upon the individual undertaking, but indirectly, and sometimes directly, upon the whole gas industry. If gas is damned by a consumer in some obscure place through poor service, one often finds the influence extending to the disgruntled consumer's friends in other towns, and prejudice is thereby created. On the other hand, good service rendered and talked about enhances the good-will of the whole gas industry. From experience in Birmingham there can be no doubt that, if a gas undertaking is to obtain anything like full benefits from a manufacturing load, strict attention must be paid to this question of service and advice to the potential or actual consumer.

The remainder of the paper touched upon the definite advantages obtained from the use of gas in several of the branches of industry represented in Birmingham. This policy of good service has obtained and retained for them motive power loads which would otherwise have been lost. There is in Birmingham—probably more than any other town in the country—a very large number of small manufacturers, many of whom have installed gas-engines, but who do not employ the necessary skilled staff to keep them properly tuned-up; and on several occasions one heard of the engines being turned out and other forms of power installed because of the excessive cost of gas. The Committee therefore decided to appoint a man under the Fittings Engineer whose duty it is periodically to examine the gas-engines installed in the area, and for a nominal charge indicate and keep them in an efficient condition. The appreciation which this policy has evoked from manufacturers has been most gratifying; and he would commend it to all undertakings who have not yet adopted it, if their motive-power consumption is sufficient to justify it. The fitter who deals with this matter was sent for a course of training to the gas-engine manufacturers' works, and is therefore an expert on this type of plant. It might interest gas managers to see the typical letter which is sent out from time to time to firms owning gas-engines.

Dear Sir,—It is the desire of the Gas Department to assist manufacturers in every way in connection with all questions regarding power developed by gas-engines; and for this purpose we have appointed a special representative to deal with such matters.

Our representative will be in your district during the next few days; and we propose asking him to call upon you in connection with this matter, when he will be very pleased to discuss with you any points if you have experienced any difficulty in the running of your engine, or if you are contemplating further extensions. There will be no charge for this assistance.

We are prepared (for a nominal charge) to carry out indicator tests on any engines, with a view to locating faults, such as in valve setting, timing, &c., or to arrive at the power absorbed in driving any particular section of the factory. This test can be arranged by appointment.

Yours faithfully,
(Signed) General Manager and Secretary.

The use of electricity for power has, of course, come to stay; and, in fact, it is adopted in most up-to-date gas-works. But there are certain loads which the gas-engine can more economically deal with; and even where conditions are such that electric motors form a more convenient source of power, current can be generated cheaper by a gas-engine on the premises than that obtained from the town supply mains. In certain classes of work where sudden peak loads have to be met, it has been found that gas-engines have replaced motors which were unable to withstand the momentary overload. The momentum stored in the engine fly-wheel will carry it over the crucial moment during which the motor windings would have burnt out, unless the motor employed had been much larger than necessary to carry the average load.

Dealing again with service rendered to manufacturers, the following are two typical examples of the manner in which the Corporation are frequently able to assist in overcoming difficulties, and to cheapen costs of production.

The first one is in connection with a particular process in which 60 or 70 gallons of water at a temperature of about 170° Fahr. are required to be delivered into mixing vats, and owing to their construction it is not possible to supply heat to the vats themselves. Until recently the water was made hot by blowing steam into it from a large steam-boiler situated outside the works. The objection to this method was the time taken, first to get up steam in the boiler, and, secondly, to heat the cold water in the vats by blowing steam into it. The apparatus designed by the Fittings Engineer, and which has been installed, delivers hot water direct into the vats, and has resulted in an immense saving of time; the quantity of water required being obtained in about fifteen minutes. It is simply an arrangement of two concentric spiral coils separated by an iron chimney. The chamber burner fixed at the base of the inner coil consumes up to 1000 c.ft. per hour, and is provided with air blast. The products of combustion pass upwards through the inner coil, and downwards, round the outer coil, on their way to the flue. The coils are made of seamless steam tubing, and the conjunction between the two coils is made with a union joint, which is kept out of the direct action of the heat. The renewal of the coils, when necessary, is a comparatively easy matter.

At this same factory, a large amount of gas is used for firing porcelain; and during the process of firing it is necessary to vary the temperature in the furnaces. To enable this to be done simply, a type of regulator working on the venturi principle has been fixed. A 3-in. supply is run from the ordinary low-pressure meter to the furnaces, and is fitted with a restriction at a point convenient for the fixing of the apparatus. On each side of this restriction is connected a pressure pipe to a King's differential gauge. The pressure difference indicated by the King's gauge varies from half-a-tenth to fifteen-tenths, according to whether the consumption is 50 or about 2000 c.ft. per hour; and the gauge is calibrated in cubic feet per hour instead of in inches of water pressure. A large regulating valve is provided on the supply to the furnace, and all the attendant has to do is to turn this valve on or off until the gauge indicates the consumption per hour at which it is desired to feed the furnace.

Motor Car and Motor Cycle Industries.—These industries are divided into small branches, owing to the multiplicity of parts necessary in car and cycle work; and town gas, as a fuel, plays a most conspicuous part in the production of these components. All aluminium castings—such as engine cases, crank cases, &c.—are produced from aluminium alloys, both mixed and re-melted by gas for sand and die castings. Aluminium-melting furnaces produce these articles; and added to the general advantages already mentioned, gas is particularly used owing to the ease of obtaining accurate pyrometrical temperature measurements, and the freedom of the metal from contamination during melting. In the steel component parts, case hardening and re-heating operations are carried out in gas-furnaces, mainly of the natural-draught oven type. In some cases, oven furnaces with air under a slight pressure are used by large and small manufacturers.

Fool-proof control and absolute cleanliness are the features of gas fuel in these particular operations. Black and coloured japan finishes are obtained exclusively in gas-drying stoves; and the work is particularly free from the risk of peeling and breaking-off often experienced with producer gas. Gas-furnaces at temperatures up to 1500° C. are used for firing sparking-plug insulators. Town gas affords quick heating with freedom from dust particles so essential in porcelain firing.

Cycle Industry.—Most component parts are made with similar furnaces to those of the car. Huge quantities of gas are used for the brazing of steel tubes into brackets for both frame and handle bars. This gas application, though inefficient, is essential, owing to the varying flames required by the operator. Steel tubes for brake and gear controls are brazed in gas-furnaces, and are free from contamination obtaining with producer or Mond gas.

Lamp Manufacture.—Many firms in Birmingham concentrate on the manufacture of various types of lamps. Gas is used in most works for annealing brass stampings or spinnings; the oven type of furnace being generally used. Time and labour are saved with gas-furnaces, and output is considerably increased. The shorter working days now in operation tend to make the gas-furnace indispensable, owing to the short time required for obtaining working temperatures. With tin lamps, soldering operations are carried out by irons heated in low or high pressure soldering stoves. If gas-stoves are used, the nuisance of time lost in lighting and making-up coke stoves is eliminated. The life of copper bits is considerably lengthened. Japanning and other finishes of lamps are obtained in gas-stoves or tables.

Aluminium.—Apart from its use in the motor industry, aluminium is used largely for domestic ware; and melting is carried out in a similar way. The annealing of aluminium is successfully negotiated in gas-heated oven furnaces.

Glass.—Small gas-heated tanks are used for glass melting in small quantities. Gas-heated glory holes are in use in several works for re-heating during blowing operations, and Lehrs—usually of the travelling type up to 70 ft. long, with a temperature gradient from one end to the other—are heated by suitably designed gas-burners. The oven furnace is used for bending glass discs for mirrors, lamp glasses, &c.

Brass and Gunmetal.—In the brass-casting shop, gas has been most successful for melting; and though at a disadvantage to-day in fuel cost, the cleanliness of melting, superiority of work, labour saving in handling fuel, disposal of ashes, and reduction of metal losses, have led to its retention. Gas-stoves are used for drying sand cores. The treatment of dies, press beds, and tools demands careful and accurate handling, only to be obtained with gas-furnaces. For the annealing of stampings and spinnings already referred to in lamp manufacture, the speed of working has been increased, and demands from various shops met more easily with the adoption of gas-oven furnaces.

Tinplate Trade.—Hundreds of gas-heated soldering-iron stoves are in use in this industry; and the cleansing vats, grease pots, and tinning vats are successfully heated by gas.

Confectionery Trade.—Town gas is replacing other fuels in the bread and confectionery trade, owing to its absolute control, cleanliness, and freedom from obnoxious odours likely to be absorbed. Gas-heated copper pans are largely used for sugar boiling; and in view of recent experiments greater things are hoped for in this direction.

Forging.—Many types of forge furnaces are in use for production of engineering forgings, and also for nuts and bolts. Greatly increased production, freedom from scale, and longer life of cutting tools are guaranteed with gas as a fuel; and recent developments in furnaces will lead to a far wider adoption of gas in the future.

Tubes.—The tube industry demands gas for annealing and brazing. The Corporation feel that they have been of great service to the manufacturer in providing a more economical, cleaner, and far easier method of working than has been the case with the coal-furnace.

Precious Metals and Jewellery.—Many are the gas applications in a jeweller's workshop. He requires blowpipes and a muffle furnace for annealing gold and silver, and also for the many beautiful enamel productions. Gas-furnaces are also used extensively for melting gold and silver with reclamation of valuable metal in the case of a spilled crucible.

Electro-Plate Trade.—In its gas applications, this industry follows closely that of the manufacture of lamps, brass pressings, &c.

Steel Pens, &c.—Manufacturers of steel pens, holders, &c., use gas for annealing, hardening, tempering, and for final colour finishes.

Tube Furnaces.—Particular mention may be made here of a tube furnace installed for the manufacture of steel penholders. With this, furnace work is suspended in a tube externally heated, and covered with a gas seal. Perfect cleanliness, freedom from scale, and minimum distortion are always obtained.

Enamel Trade.—A number of muffle furnaces are in use for the enamelling of signs and metal dials, &c. Apart from general advantages, the absence of dust particles from the enamel during firing is an important feature of a gas-furnace for this work.

Varnishes and Paints.—Gas is used extensively for the boiling of gums and oils; increased speed of working being obtained over the solid fuel fire. The temperature is under control, and is not subjected to alteration by unknown conditions, which leads to a far less risk of fire than with a solid fuel furnace.

Judging by the increased consumption of gas for industrial purposes, and greater activity in the Industrial Research Laboratories, trade in Birmingham is certainly showing an improvement. During the twelve months ended March, 1923, the quantity of gas consumed for manufacturing and motive-power purposes amounted to 2,852,337,500 c.ft., or 26 p.ct. of the total consumption of gas from the department. It was only during the latter part of the year that the improvement in consumption began to be felt. This improvement is continuing; and in the quarter ended June this year, the increase over the corresponding quarter of last year amounted to 174,858,000 c.ft., or 27½ p.ct. Mr. Smith expressed the hope—notwithstanding all the forebodings in the Press—that we shall ere long see a full restoration of trade, and an increasing use of gas, bringing with it, not only advantages to the manufacturer and the gas undertakings, but a substantial reduction of the smoky atmosphere which surrounds our industrial areas, and affects so injuriously the health of those who have to live and work in it.

Heat-Treatment by Town Gas in Midland Industries.

By C. M. WALTER, D.Sc., Engineer-in Charge, Industrial Research Laboratories, City of Birmingham Gas Department.

In opening, the author pointed out that Birmingham, with its outlying manufacturing districts, might perhaps be said to be one of the most remarkable cities in the world from the point of view of the enormous variety of trades with which it is associated. For purposes of reference, compilations of various industries under headings and sub-headings have been made; and of the industries in which heat-treatment, in some form or other, plays an essential part, one is able to find upwards of 100 different trades, apart from processes, in the Midland area. With regard to manufacturing processes in which the heat-treatment of metals, non-metals, and alloys takes place, these number many thousands. In fact, it is to-day hardly possible to find any industry into which some form of heat application does not enter.

Of course, certain types of industrial heating plant are suitable for a considerable variety of work, especially in the case of furnaces having working temperatures ranging up to (say) 900° C. With the improvements which have taken place in recent years, this temperature can be obtained even in some of the largest furnaces by the employment of town gas at ordinary pressures, owing to the ever-increasing efficiencies which have been secured by the use of some form of regeneration; and, in consequence of the simplicity of design and the fact that no form of motive power is necessary in the running of plant of this kind, it would appear that the natural-draught furnace is by far the most popular among manufacturers requiring temperatures not exceeding those needed for case-hardening purposes.

In Birmingham and the outlying districts served by the City of Birmingham Gas Department, approximately 60 p.ct. of the total heating apparatus, excluding blowpipes and soldering-iron stoves, consists of natural-draught furnaces; and the tendency at the moment is for the natural-draught furnace to replace the blast type of furnace, even in some of the processes requiring the higher temperatures, which it has now been possible to attain by means of the extended application of recuperation and regeneration. It may not be generally known that temperatures as high as 1900° C. have been attained in specially designed natural-draught furnaces fitted with recuperators; the "Revergen" furnace manufactured by Radiation Limited being a typical example of one capable of such a performance.

Dr. Walter then proceeded to refer particularly to the more general form of heat-treatment operations, giving examples of the types and forms of furnaces used for each application, and also mentioning a few of the more recent types of furnaces which have been introduced to meet the many and varied requirements of the manufacturer. In the manufacturing districts of the Midlands, the heat-treatment operations which one encounters are such processes as case-hardening, re-heating, annealing, normalizing, the treatment of high-speed steels, vitreous enamelling, firing of ceramic ware, forging, metal melting, tin-plate working, jewellery manufacture, tube making, and glass manufacture.

With regard to the general heat-treatment, it will be found that there are two distinct classes of furnace plant required in this connection, according as the process is a continuous or intermittent one—that is to say, where larger furnaces are employed, one has many opportunities of installing the more efficient type of regenerator with partial or complete regeneration of gas, air, or both. Where it is not permissible to use a furnace of this type, owing to the nature of the work being intermittent, the simple direct heated under-fired furnace, though not so efficient as the strictly regenerative type, is found to be generally more satisfactory, owing to the comparatively short period required for obtaining a working temperature. This applies also in the case of small furnaces used intermittently for the heating of small tools, and also for jewellers' work, where the period of heating in some cases only lasts a few minutes.

The first of a number of photographs relating to actual installations which accompanied the paper had reference to carburizing and re-heating furnaces installed in the works of a large Birmingham manufacturer, which have been in daily use for a number of years in connection with the manufacture of motor-cycle components. For this class of work, a temperature of about 900° C. is required for carburizing; the periods of heating varying from

five to ten hours, according to the class of work and depth of case required. For re-heating temperatures of approximately 900° C. and 785° C., it is found that the furnace may be used for both operations. This installation alone represents an annual consumption of approximately 5,000,000 c.ft. on a 47-hour working week.

Here followed illustrations of an installation of five regenerator type natural-draught oven furnaces, also used for the carburizing and re-heating of motor and cycle component parts; each of these furnaces being approximately 6 ft. by 4 ft. inside measurements, and each representing a consumption of 1000 c.ft. per hour, and being in constant daily use.

Then there were pictured two natural-draught (medium size) annealing furnaces of the small regenerator type, used for the annealing of brass spinnings and stampings in connection with the manufacture of motor lamps and fittings. For this class of work, the advantages to be gained by the use of gas are very considerable, compared with the ordinary type of solid fuel muffle which the gas-furnace is fast replacing, for the work is heated uniformly, the amount of scale produced is a minimum, and the deleterious effects produced by a sulphur-laden atmosphere are entirely eliminated. Further, a very important point in regard to installations of this kind is that the total amount of floor space occupied is not more than 50 p.ct. of that required for a solid fuel furnace of similar capacity.

Where the operation is a continuous one, every effort should be made, in the installation of the larger sizes of furnaces, to guard against losses due to radiation from the furnace wall; and also the amount of heat carried away by the waste gases should be reduced to a minimum. Thus in all such instances some form of regenerator or recuperator should be employed; and, further, the insulation materials should be of the highest quality. During the last few years the department have made a practice of paying particular attention to lagging, with the result that manufacturers have in some instances been able to reduce their heat losses by anything up to 30 p.ct., by the employment of suitable lagging material.

Where the working temperature is high, as in the case of vitreous enamelling, forging, and ceramic firing, requiring 1000° to 1500° C., a recuperator type of furnace can be utilized with advantage; and, further, the very high temperatures required can be obtained in this type of furnace without the introduction of an excessive air pressure—in most cases a fan blast is satisfactory.

For the lower temperature operations—say, up to 900° C. for continuous working—it is found that some form of counter-current regenerator will give the most satisfactory results; and a great deal of time has been devoted by the Corporation's Industrial Heating Section to experimental work in this direction. It is more than interesting to mention that since the termination of hostilities some most excellent examples of furnaces are to be found listed by the various furnace manufacturers; and undoubtedly a good deal of pioneer work has been carried out by these firms in the development of this particular type of furnace.

A Modified Counter-Current Regenerator.

Recently, in collaboration with Messrs. Gibbons Bros., Ltd., a series of tests has been made, using town gas in a modified form of counter-current regenerator, such as this firm have for many years adopted for the firing of the larger types of producer-gas furnaces, with a view to designing a highly efficient counter-current regenerator, and, further, to eliminate as far as possible the employment of burners and metal fittings, or, in other words, to burn the gas in bulk through fireclay ports in a regenerative setting similar to those used in the ordinary regenerative retort setting. [This furnace was described and illustrated in the Exhibition Number of the "JOURNAL," pp. 827-28.]

It is interesting to note that the travel of the waste gases through the regenerative portion of the setting in the case of a furnace 4 ft. 6 in. by 2 ft. 6 in. is no less than 45 ft. There are three rows of waste-gas flues interposed between the air regenerators and the gas manifolds. The weight of the regenerator system alone is about 2 tons. This furnace operates entirely on the natural-draught principle; the only flue pull required consisting of a length of about 15 ft. of ordinary piping. In the preliminary tests a load of 10 cwt. of cast-iron billets was placed on the working hearth, and soaked through to a uniform temperature of 925° C.; the figure of efficiency obtained, taken as the B.Th.U. usefully employed in heating-up load to the total B.Th.U. supplied, being 35 p.ct. From the experimental work so far carried out, it would appear that the possibilities of this type of furnace are very considerable, especially where the heating operation is a continuous one. Furnace temperatures considerably over 1100° C. can be obtained, if required.

Smaller Types of Furnaces.

Regarding manufacturing processes in which smaller types of furnaces are used—such as for the hardening of carbon steel and high-speed tools, punches, and similar work—the small direct-fired furnace finds an important place in this class of work. Generally speaking, little advantage is to be gained in such cases by the use of any form of regenerator work or recuperation, owing to the fact that the speed of working should be at a maximum, and in many instances the furnaces are only in operation for short periods, intermittently. In the Midland district, one finds many furnaces of this kind; and very often it is advantageous to instal these by the side of machine tools to enable the operator to re-harden small tools without referring to the hardening shops. This is again indicative of the enormous advantage of the gas-furnace.

An important industry in which great developments took place during the war is the hot stamping of non-ferrous alloys—in particular, brass. In Birmingham, many thousands of tons of this class of work are produced annually; and practically all the firms engaged in the industry use gas-furnaces for the heating of billets prior to stamping, as this method is found to be most satisfactory from every point of view, and results in the work being heated up uniformly, with a minimum of scale. Gas plays an important part in the brazing of the many joints required in cycle and motor frames, car frames, handlebars, &c.; and the number of blowpipes used in Birmingham and the surrounding districts must amount to thousands. In this connection, gas is a *sine qua non*; and as in many cases it will be found that the brazing pipes used are not working efficiently, it is most essential that gas undertakings should offer every facility to cut-down consumption, to ensure that the best possible results are being obtained, for blowpipes can easily be used in a very wasteful manner. Where the brazing operation refers to small articles on a mass production scale, liquid brazing has been found satisfactory and more efficient; and in the case of some of the larger brazing work the operation is carried out in a high-temperature furnace.

Another industry into which brazing enters is that of brass, steel, and copper tube manufacture; the brazing of this class of work usually being carried out in a continuous furnace, having a gradually increasing temperature up to the brazing zone. Some excellent furnaces of this type have been installed in the Birmingham district, and have replaced the older types of coal hearths.

Birmingham, as is generally accepted, holds a unique position regarding the manufacture of jewellery of all kinds. In this city one is able to see produced from the raw material some of the highest classes of art craft. Gas plays a most important part in the working-up of the precious metals used in this industry, from the melting of the gold and silver, the annealing for rolling of the pure metals and alloys into strip, and the soldering operations which figure so eminently in the finishing of this class of work. One would probably be surprised at the many thousands of small sidelights used in the jewellers' districts in connection with the soldering of mounts, chain links, necklets, and bracelet setting, and the hundreds of other branches of the making-up of jewellery. Many of the most delicate operations would be quite impossible without gas. The enamelling in colour of gold and silver mounts forms a very big part of a jeweller's work; and this is carried out in small gas-heated muffle furnaces, which are always part and parcel of a jeweller's working equipment.

Among some of the most interesting heat-treatment operations may be classified the enamelling of copper and iron plates for the production of instrument dials, meter dials, clock faces, and the larger number plates, name plates, and advertisement signs. For the enamelling of special art name-plates of a large size, the ordinary type of oven furnace is used very satisfactorily; but with the immense progress which has taken place during the last few years with the regenerative and recuperative types of town-gas heated furnaces, the day should not be far distant when the very large plates used for advertising purposes will be enamelled in gas-heated muffles in an efficient manner, and on a commercially economic scale. The department also look forward to replacing with gas-furnaces the large enamelling muffles used for saucepan and domestic enamel ware production. Still another important industry in the Midlands, and perhaps one of the oldest with the exception of the gun-making trade, is the tin-plate trade. Here, again, gas is used in almost every operation connected with the manufacture of lamps, gas-meters, churns, domestic ware, &c., with the result that thousands of gas-heated soldering-iron stoves are employed—several firms alone having installations of over 100 stoves. In view of the importance of encouraging the use of gas, a large amount of experimental work has been carried out by stove makers and the department, in order to ascertain the best stoves for each particular class of work.

When taking into consideration the saving in copper, which with the old-pattern coke-heated stove was removed from the soldering irons in the form of an oxide scale, the saving, even on a small installation of gas-heated stoves, is very considerable, and the time required for re-tinning of soldering-iron bits is reduced to an absolute minimum. Work may also be commenced almost immediately after the stove is lighted; whereas in the case of the coke-stove time is wasted in the lighting of the fire and making-up during the day. Many of the new types of soldering-iron stoves available, heated both by low and high pressure gas, are admirably suitable for most classes of this work. In the tin-plate industry, gas also plays an important part in the melting and mixing of solders, and also in the cleaning and tinning operations during the processes of manufacture.

As to the melting of brass, gunmetal, aluminium, phosphor bronze, nickel, and nickel alloys, with falling prices of gas it is hoped that the load from this source will continue to increase, though even with the exceptionally high prices which have prevailed, the melting of aluminium and white metals, and also the higher melting-point alloys, has continued despite the big fuel cost, owing to the many advantages to be obtained in other directions by the use of gaseous fuel.

The Use of Gas in the Boot and Shoe Industry.

By GEO. S. EUNSON, Engineer and Manager, Northampton Gas Light Company.

There are at present, the author said, 230 gas-engines at work in Northampton; and all of them are giving absolute satisfaction. The price of gas charged by the Company for engines is 6·08d. per therm net; and with a gas-engine having an efficiency of 9600 B.Th.U per H.P. per hour, the cost for gas is 0·58d. per H.P. per hour. At this figure gas is the cheapest form of power; and for those manufacturers who prefer to have their machines driven with an electric motor instead of using shafting, a gas-engine and dynamo can produce electric current, including capital charges, working expenses, and interest and depreciation, at 1½d. per Board of Trade unit, which can be used for lighting as well as power. When one considers the price charged by electrical undertakings for current for lighting, it shows how very economical the gas-engine is, besides being more reliable than the electric motor. One difficulty that the Company have to contend with is that the modern factory is not designed for shafting, as the architect, relying on electric motors being put-in to drive machinery, makes no provision for the girders necessary to carry shafting; and when once the factory is complete, it is a big expense to put these girders in. The "B.C.G.A." are doing much to bring matters with reference to the gas industry before architects; and this is one that might be dealt with to great advantage.

Gas for Lighting.—Gas still holds its own as an economical and efficient light. Its colour, the absence of eye strain to the workers using it, and its price are factors which weigh very much in its favour. The Company have working in the town large installations of both low and high pressure; and they—especially the latter—are holding their own against any other form of lighting.

Gas for Heating.—The gas-radiator is now largely used in factories for the drying of leather and of finished boots, and for the warming of rooms for the comfort of the workers. Central heating by means of hot-water pipes heated by a coke-fired boiler is in use in some of the more modern factories; but the gas-radiator has been found to be more economical, as there is no waste in heating the long length of pipes necessary for conducting the water to the different departments, and one department can be heated without the necessity of keeping the whole of a large installation going.

Gas for Machines.—Gas is used on many of the machines for the manufacture of boots.

For heating the composition in the manufacture of toe cases.
For heating the composition bottom filling.
For warming patent leather in the process of lasting.
For finishing irons and heating the burnishers of edge-setting machines.
For heating wax for waxing thread in rapid stitchers.
For the making of heel balls; and for many other things.

SPENCER-BONECOURT BOILERS.

In advocating the use of a gas-engine in a factory, we are continually up against the argument that a certain amount of steam is necessary, and that it is therefore better to put in a steam-boiler and drive the machinery with a steam engine. This has now been overcome by the introduction of a tubular boiler fired with gas. Two years ago we introduced a boiler of this type made by Spencer-Bonecourt, Ltd., into a polish manufactory. This has been a great success, and has been in continuous use ever since. We also have one working in the leather-dressing department of the Technical School.

The boiler is 4 ft. 6 in. diameter, 6 ft. long, and is capable of producing 2000 lbs. of steam per hour at 100 lbs. pressure. The gas consumption is 3500 c.ft. (470 B.Th.U.) per hour, when working at full load. The gas pressure is 3½ in.; and 100 lbs. pressure of steam can be raised from cold in 34 minutes. After that the gas can be regulated as the steam is required. There is no fire-box, and the burners are designed so that no primary air is necessary, and back-firing is impossible at any load. No stoking is needed, and the attention of a man is only required to see that the necessary water level is maintained. The gas has only to be lighted half-an-hour before steam is wanted; and the whole thing is shut-down by the turning of valves. For an intermittent supply of steam this is economical, and will find favour with manufacturers.

There is an increasing field for the use of the gas-engine; and a careful placing of the facts before the manufacturing public will result in a steady increase in the day load.

Discussion.

MR. SAMUEL TAGG (Preston) said the conference much appreciated the excellence of the three papers, two of which explained to some extent why Birmingham had such a large industrial load, and why that load was likely to be increased. There were few gas undertakings which were in the position of having the support of so many diversified industries. At the same time, he thought they in other towns probably under-estimated the number of industrial processes which should be served with gas; and in this direction they might with advantage make a more complete survey, and satisfy themselves that they had done what was necessary in bringing home to manufacturers the advantages of gas for power and heating purposes. It was obvious that in many towns the demand for gas for industrial purposes would not, and could not, be sufficient to justify the establishment of laboratories and testing-rooms and the employment of a highly-skilled staff, as was done in Birmingham; and he liked to think that the Birmingham Corporation would be willing to give the benefit of their resources to other municipal undertakings or companies that might need them. In this way, they would be conferring a great benefit upon them.

MR. RALPH HALKETT (Sheffield) insisted that the main point for consideration was the question of giving the consumers the best possible service. Sheffield, like Birmingham, was well placed for industrial load. He thought all admired the great pains which had been taken to perfect the Birmingham research laboratories. Such resources were essential for any gas undertaking catering on big-scale lines for the industrial load. It was necessary to show a furnace capable of doing a particular job; and if this did not suit the prospective consumer, to design one that would meet his wishes precisely. He did not think they had failed in Sheffield in a single case to design a furnace satisfactorily to meet a customer's requirements. He attached great importance to the work of capable officials going round the district, and making sure that the industrial equipment was in order, and giving the best possible service. So much depended upon the human element. Some time ago, they received a complaint from an industrial firm; and on making investigation, it was found that they were consuming 50 p.ct. more gas than was necessary, and not obtaining the efficiency that should be secured by that 50 p.ct. A regular and capable staff carried out this work; and he received reports daily. There was competition from oil, producer gas, and electricity; and in regard to the last named, he mentioned that sales of current were made at prices substantially below—sometimes 300 p.ct.—the rates to the ordinary consumer; but he did not think the difference in many gas undertakings was above 30 p.ct. Having regard to that kind of competition, with electricity sometimes sold at less than cost price, it was a great thing for the gas industry that it had maintained its position as well as it had.

DR. A. PARKER (Department of Fuel Research, Leeds University) inquired, in relation to Dr. Walter's paper, if one could not use the figure of the mean specific heat for a working temperature range for computing furnace efficiencies.

DR. WALTER said Dr. Parker would undoubtedly agree that if such metals as platinum or nickel could be used for loads, the specific heat being practically constant over the range of ordinary temperatures would enable calculations to be made on that basis. But in the case of steels—especially carbon and alloy steels—one had to remember that endothermic and exothermic reactions took place at certain temperatures, which must be taken into account when computing the total heat of a load of this material.

PROF. BAKER, of Bombay (formerly Director of Instructional Factories, Ministry of Labour), said it was a matter for great satisfaction that the Birmingham Corporation were doing so much effective research work. The gibe was frequently made that we in this country were deficient in technical knowledge and training, and that America and Germany were much ahead of us. This was not true. We had all the technical training that was necessary, and we had the best of technical men; but it was true that we had not used their abilities. This matter had to be remedied; but what was now being done showed that the commercial and manufacturing world was beginning to appreciate the value of scientific research. He cordially agreed that both gas and electricity had their place. There was need for both; and this need was usually well defined.

MR. F. W. GOODENOUGH congratulated the authors upon their excellent contributions; and referring to Mr. Tagg's suggestion that, in relation to scientific research and tests the larger undertakings which were in a position to provide such facilities should afford advice and guidance to the smaller undertakings, he said he did not think there would be any serious difficulty in securing such co-operation. On payment, of course, he hoped it might be possible from time to time to secure in their own districts the services of the scientific men who were in the employ of a few of the very large undertakings. In London they were carrying out the practice of regularly visiting factories, not only to see that the gas equipment was in efficient order and best adapted for the kind of work it was doing, but also to do what they could in the direction of extending the gas service in the factories. This work had proved of great value to the Company and to the consumers. They were getting splendid results in increased business; and the manufacturers were equally satisfied with results they were obtaining in improved output and reduced costs. They had retained the customers that they would probably have lost in consequence of extravagance in the consumption of gas or ignorance in the use of it; and they had been able to point, in many cases, to other ways in which gas might be employed to advantage. It occurred to him, too, that a real advantage to the industry might be obtained by occasional conferences, in various centres, of the men engaged on research and kindred work, on similar lines to those in connection with the Salesmen's Circles. An exchange of ideas was invariably beneficial to all. He added that they in London had for a long time supplied gas-engines on hire-purchase terms; and this had helped them to maintain the power load. Competition with regard to power was constant and severe; and it behoved gas undertakings to do everything possible to enable consumers to get the maximum value from the gas they were using.

MR. NORMAN S. COX (Sunderland) observed that a certain amount of work had been done in their district to encourage gas for power and furnace work. In the glass industry, developments took place to a considerable extent; but during the war oil furnaces were brought into operation, and at the moment they had only a relatively small hold again. Their prices were low; and he hoped after a time they would get back this class of business. It was gradually coming, in spite of the fact that trade and industry were bad in Sunderland. The appliances used were continually inspected by a trained staff.

MR. EUNSON, in reply to Mr. Twine, said at first sight it might appear that the cost of the use of gas for certain work in the boot industry was high; but it had to be borne in mind that the requirements were often spasmodic, and not continuous. Therefore the cost was extremely low compared with working a boiler all day long.

MR. A. W. SMITH stated that the Birmingham Gas Department were glad to help other undertakings, large or small, by research and kindred work that could be done in the laboratories. As a matter of fact, this had been given for over a long period; and applications in

relation to problems from all parts of the country were dealt with from time to time. The "B.C.G.A." frequently sought information; and it was most willingly supplied. The research laboratory work had certainly done much to stimulate the industrial demand; and by way of example, he read a couple of letters from consumers. One wrote: "We are pleased to say we are able to show a gas reduction of 40 p.ct.;" and another: "We are perfectly satisfied with the way in which you dealt with the matter with regard to our annealing problem." In this way they were creating goodwill. Much of the research work was necessarily of a confidential character; and if it were possible to write about what had been done, the narrative would read like a romance.

Mr. GOODENOUGH: I can testify that Birmingham is most generous in giving help of this kind.

Mr. SMITH agreed that gas and electricity each had its own sphere. They claimed that electricity could be developed by the gas-engine more economically than by taking it from the town cables.

PRESIDENT-ELECT AT LUNCHEON.

A luncheon, given by the President-Elect of the Association (Mr. H. Wade Deacon, J.P., Chairman of the Liverpool Gas Company), Vice-Presidents, and members, to the President of the Association, the President of the National Gas Exhibition, and the City of Birmingham Gas Committee, on Wednesday—the concluding day of the conference and exhibition—was largely attended.

The toast "The President of the National Gas Exhibition (Alderman Sir David Davis)" was proposed by Mr. R. G. SHADBOLT. [It was mentioned that Mr. Shadbolt had had the misfortune to be knocked down by a cycle while on his way to Bingley Hall; but happily he escaped with nothing more serious than a slight shock.] He referred with satisfaction to the steady and unbroken growth of the Association, and attributed it to the fact that it had been most fortunate in its administrators. He paid warm tribute to the practical interest shown by Alderman Sir David Davis in the exhibition. His encouragement was forthcoming immediately the subject was mentioned to him; and this he had followed up by real interest and effort on behalf of the movement. By reason of its association with Murdoch, there could have been no more fitting place than Birmingham in which to hold the exhibition. The use of gas was increasing at an enormous rate; and he believed the title of the publication "A Thousand-and-One Uses for Gas" would have to be revised in the near future.

The LORD MAYOR, acknowledging the toast, said the exhibition was a credit to the gas industry; and the promoters, and those responsible for the immediate work connected with it, were to be warmly congratulated. The bulk of this work had been cheerfully—and, indeed, enthusiastically—borne by the staff of the Birmingham Gas Department; and in this connection he specially alluded to the work of Mr. R. J. Rogers, Mr. Ayre, and Mr. Whitehead. He thought the exhibition, besides appealing strongly to those in the gas industry, had greatly interested the "man-in-the-street;" and to him personally the exhibition was a revelation. The visitors had numbered 80,000. [Applause.] They had come from all parts of the country, and a limited number were from overseas. The lectures had been well attended, and particularly those which dealt with gas-cooking. Thousands of Birmingham and Midland women had learned much of domestic value; and he believed the information which had been imparted would be reflected in an increased demand for gas-heated equipment. The educational value of the large exhibit of the "B.C.G.A." could hardly be exaggerated; and medical men and scientists had expressed to him their astonishment at the very large number of things which emanated from coal distillation. His Lordship mentioned an interesting incident which took place a few days previously at the exhibition. The bust of Murdoch adorned the miniature garden at the main entrance; and one morning it was found that a bunch of pansies had been placed at the foot of the pedestal. Accompanying the small floral tribute was an inscription: "From a woman—one of millions who are grateful for the boon of gas, and think kindly of its discoverer." If sentiments such as this could be inculcated into the public mind, there would be no reason to fear the future. The promoters had succeeded admirably in showing the many uses to which gas could be put; and to the exhibitors most excellent service had been rendered by Mr. Stanley, the Exhibition Director.

Mr. F. W. GOODENOUGH, on being called upon to propose the next toast, that of "The President of 'B.C.G.A.,'" first read a letter from Sir Thomas Paxton, the Lord Provost of Glasgow, regretting his inability to be present. "I wish," he wrote, "to send you a line of most cordial good wishes for the success of the conference. The Association has done nobly in the interests of the gas industry in the past, and I congratulate it on its present progressive position. I know of no organization that is keeping abreast of the times better than your Association; and I know that the annual conferences are of great value, not only in bringing together all interested in the gas industry, but in giving opportunities for the exchange of ideas and the dissemination of knowledge with regard to what is taking place in the country from year to year." Mr. Goodenough referred to the wholehearted and efficient way in which Alderman Lloyd had discharged the duties of the office of President, to his personal charm of manner, and to the great value of his guidance upon business matters. ("Hear, hear.") Sincerity had characterized his work throughout.

Alderman LLOYD, in reply, said his virtues had been exaggerated and his faults obscured. The plain fact was that for years Mr. Goodenough had been the driving force of the Association. ("Hear, hear.") A year ago, at Bristol, when his nomination as President was made, those of them from the Midland District ventured to suggest that it might be possible to arrange an exhibition in Birmingham. They did this with some slight misgivings; but he approached some of their local friends, and was pleased to find they were unanimous in their support of the suggestion. The Birmingham Gas Committee appreciated very much the kind remarks that had been made concerning him; and he could only add that they regarded in the nature of a privilege anything they had been able to do to make the meeting successful.

On the motion of Alderman LLOYD, the health of the President-Elect was drunk with enthusiasm. They were sure, he observed, that Mr Wade Deacon would make a most genial and able President.

Mr. DEACON replied in humourous vein, and added that no effort would be spared to make the Liverpool visit successful.

The concluding toast was that of "The Press," which was submitted by Mr. S. TAGG, who observed: "As regards the Technical Press, we appreciate highly the inspiration and enterprise and the constant efforts they make to serve the industry with which they are identified. The debt we owe to our own efficient Technical Press is beyond our redemption."

GAS IN CATERING.

Wednesday afternoon's concluding conference session had for the subject of discussion "Gas in Catering." The PRESIDENT took the chair at the opening; Mr. Goodenough presiding over the remainder of the proceedings. The following four papers were read:

"Gas for Catering and Canteens." By Mr. R. G. MARSH, of Birmingham.

"Gas for Sugar Boiling and the Making of Confectionery." By Mr. W. B. M'Lusky, of Halifax.

"Gas for Beer Boiling." By Mr. WILLIAM WILSON, of Burton-on-Trent.

"Gas for Fish Frying." By Mr. HARRY CLARK, of Derby.

Gas for Catering and Canteens.

By R. G. MARSH, Fittings Engineer, City of Birmingham Gas Department.

The author illustrated and briefly described a few installations of gas for catering and canteens representative of their type. In the midst of a large industrial and residential area, Birmingham has had perhaps what may be considered a unique experience in the installation of cooking apparatus to meet every possible requirement; and kitchens equipped with gas have proved entirely satisfactory. Care is taken always to supply the apparatus best suited for the work it is intended to do. The services and advice of the Corporation are always available; and, if desired, they are pleased to arrange for the periodical inspection of any installation, as well as to undertake all repairs and maintenance.

At the works of the Austin Motor Company cooking is carried out at the present time for 300 (foremen and members of the staff). One range of six ovens is used for pastry, the other for roasting meat; the meat is always roasted in tins, not hung in the oven. This is so even with large roasters 6 ft. high. The chefs consider that more use can be made of the room in the oven in this way, and consequently less gas is consumed per pound of meat cooked. During the war 9000 people were employed at these works, and cooking for 6000 was in progress night and day, only gas being used for the purpose. The Wesleyan and General Assurance Society cater for a staff of 200. Meals are provided daily consisting of meat, two vegetables, and sweets; and teas are also provided. The whole of the meals throughout the day for the inmates of the Blue Coat School in Birmingham are prepared by gas. The menu provided in this case is rather plainer, but consists of plenty of good wholesome well-cooked food for 220 boarders.

A model installation has been provided at Messrs. Barrows', for high-class café work. The number of meals served on an average is 1800 per day, increasing sometimes to as many as 2000. At Messrs. Lewis's popular café a large number of meals is provided daily, both for the firm's customers and also for their own staff. The equipment of the G.P.O. Dining Club has to provide a 24 hours' service every day, available to any of the 1800 members. About 1000 diners, and the same number for tea, are the usual number provided for daily; while 600 suppers and 300 breakfasts are also required. In addition, light refreshments are on sale day and night. The menu is very varied.

The buildings of the Princess Mary Training Centre for Disabled Soldiers, at Rednal, near Birmingham, were erected during the war as hostels for munition workers. There are now about 500 resident ex-soldiers, who are being trained for various trades and professions, including watch-making, tailoring, hairdressing, carpentry, poultry farming, gardening, &c. The whole of the cooking is by gas. There are also about forty gas-fires distributed throughout the institution; and several geysers are in use. The water for the hairdressing saloon (which is a very fine and up-to-date one) is gas-heated; and gas is used in connection with an apparatus for hairdrying. The 500 men have four meals per diem; 250 lbs. of meat and 500 lbs. of vegetables being required daily, and 200 lbs. of fish once a week. As much as 740 lbs. of meat have been cooked in one day. About twice a week 500 eggs are fried for breakfast; these, it is of interest to note, being cooked in the carving recesses provided on the tops of the carving tables—the chef claiming that this is the best fryer he has found for the purpose. The two boilers are used for tea making. Sixty gallons is the usual quantity made.

Another installation, for the Education Authorities, is in connection with the provision of free meals to poor children. Under the provisions of the Education Act, free meals are given to necessitous school children. Upon application for free meals being made by the head teachers or school medical officers, searching inquiries are made by the school attendance officers as to the

family income. When it is found that the income is insufficient to provide the necessary food, free dinners are given by the Education Committee. Tickets are issued for a period not exceeding four weeks; and before the expiration of that time a further inquiry is made, and, if necessary, tickets for a further four weeks are issued. The number of meals given, of course, fluctuates according to economic conditions. For the week ended Aug. 18, 1923, the daily average number of dinners supplied was 570; while during the week ended July 2, 1921, the daily average was 5014. Centres at which the meals are given are arranged for groups of schools, thus enabling children to get their dinners without having long distances to walk. Small cooking kitchens have been erected under the covered playsheds on school premises; the whole of the cooking being done by gas. Usually, one large oven and two large gas-rings for boiling purposes have been found sufficient. At one of these centres, during a period of stress, upwards of 400 meals were cooked on one day. Usually the number does not far exceed 100.

The kitchen equipment for the catering requirements of the Birmingham Gas Department head office provides for about 209 dinners and 80 teas daily. Brief reference was also made to some large biscuit ovens. To show the ease of supervision and control that can be exercised over a range of ordinary baking ovens, the author alluded to a scheme installed in Birmingham, by which the foreman in charge of a bakehouse can see from his office the temperatures obtaining in any of the ovens. A thermocouple is fixed in each oven, and a pair of leads run to a selector switch in the office connected to a pyrometer. He has only to turn the switch to the stud numbered the same as the oven he wishes to examine, and the pyrometer tells him whether or not the temperature is correct.

One other phase of service given by the department during the last coal strike was mentioned. Owing to the shortage of solid fuel, a number of families (numerically large, but forming a minority of the total population) who were without gas supply in their homes were provided with hot water free for drinking purposes. At a number of schools throughout the area, gas-heated boilers were fixed, and boiling water was provided for tea-making, &c., to all who cared to send for it; the depots being staffed by voluntary workers. This is an instance showing the ease and rapidity with which gas apparatus can be provided for use in cases of emergency, and is also an illustration, by the way, of the continued reliability of gas service for long periods, even after the stoppage of coal supplies.

Gas for Sugar Boiling and the Making of Confectionery.

By W. B. M'Lusky, Engineer and Manager, Halifax Corporation Gas Department.

Sugar Boiling.

One of the most important pieces of apparatus in the sweet factory is the sugar boiler. The modern gas-heated sugar boiler, such as is now found in most factories, consists of a top and bottom cast-iron annular ring surrounded by a strong sheet-steel casing, which is securely fixed to flanges on the cast-iron rings. The boiling pan is seated on the top annular ring, thus closing the top of the boiler. The firebrick linings, made of a highly refractory material, are constructed in sections, and can be replaced with little trouble when necessary. To ensure an even boil, the heat from the burner is pulled upwards through a number of ports into the main collecting chamber. The furnace can be heated by three systems: (1) By gas at ordinary pressure, (2) by gas at ordinary pressure and air blast, and (3) by high-pressure gas. Where no means are available for supplying forced air, or where a comparatively small manufacturer is not prepared to instal an air or gas compressing plant, a furnace fitted with natural-draught burners will give satisfactory results, though it will take a slightly longer time in completing the boil, and will consume slightly more gas than the other systems. Where, however, sugar boiling is done in large or even fairly large quantities, or where high-temperature boils are essential, low-pressure gas with air blast, or high-pressure gas, will give more satisfactory and economical results. For reducing the heat at the finish of the boil, a tap or a screw-down valve is used.

These boilers can be much more quickly installed than any of the old-fashioned solid fuel apparatus. The initial and installation costs are also lower; and the space occupied is less that that occupied by a solid fuel furnace. For the small manufacturer especially, these are strong points in favour of the gas-heated appliance. Before dealing with the cost of gas for sugar boiling, it would be well to consider some of the other advantages which accrue as the result of the substitution of gaseous for solid fuel.

First of all, it reduces to a minimum the risk of impurities getting into the sugar when it is being boiled. It does not make dirty ceilings or walls in the boiling rooms. Gas also standardizes the article manufactured—that is to say, given a certain quantity and quality of sugar to be heated to a certain temperature (generally about 310° Fahr.), the regulation of the gas consumption to a predetermined rate will always ensure the same result in the same time, under the same atmospheric conditions. There is no solid fuel on the market upon which such perfect reliance can be placed.

Again, the use of gas improves the product, because, in boiling sugar and glucose, it is often found that the best results are not always obtainable from the use of one unvarying heat. In some cases the result obtained is best when the mixture is brought to boiling point quickly (as, for example, when dealing with white sweets, when the mixture is inclined to become discoloured if allowed to cook for too long a time), whereas in other cases it is found advisable to do the work more slowly. With gas, these variations can be easily and surely effected by the turning of a tap. The difficulty—one might, in fact, say impossibility—of effecting these variations with certainty when solid fuel is used will be obvious.

The gas-boiler is ready for use at very short notice. Those who have used or are using boilers heated by solid fuel will know that a considerable period elapses between the time of lighting the fire and the moment when the boiler is in full working condition. This loss of time means decreased output. A gas-boiler is in full working condition from the moment the gas is lighted. Furthermore, the boiling-house equipped with gas-boilers is kept very much cooler when gas-furnaces are used instead of solid-fuel furnaces, with the result that the cold slabs on to which "boiled goods" are placed after the boil are also much cooler. The goods in consequence cool more rapidly, and the operators can work them up more quickly.

With the gas-heated sugar boiler the first boil can be obtained within 30 minutes of lighting the gas. Subsequent boils average 20 minutes. No time of the operator is taken up in stoking and clearing away ashes when the boiler is in use. He can, in consequence, give his whole attention to the boiling of the sugar; the fire being capable of looking after itself. Finally, no room for the storage of fuel is required when gas is used.

Having briefly stated some of the advantages of gas-boilers, the question of fuel costs remains to be dealt with. It is difficult to give information of practical use to all who may be interested, because conditions and requirements in the confectionery trade vary considerably. The following results of a test carried out some time ago will, however, provide a basis from which confectioners can calculate the cost at the price for gas ruling in the district in which their factories are situated. In the test in question 56 lbs. of Lyle's granulated sugar mixed with 5 quarts of water were raised to a temperature of 300° Fahr. in 27 minutes. The consumption of 500 B.Th.U. gas was 112 c.ft., or slightly more than half a therm.

Other Uses of Gas in the Confectionery Trade.

Toasting Caramels.—For toasting caramels, a strongly concentrated heat is required which will toast the caramel on the surface without cooking it internally. This operation is now being carried out with great success by a gas-heated toaster which closely resembles a self-contained griller. The sweetmeat is made up into slabs, and is placed upon an iron tray, which is inserted into the toaster in a manner similar to the placing of a chop or steak in a griller. The caramel toaster has been designed to give perfect results with a minimum consumption of gas. It is heated by bunsen burners, the flames of which stream across the surface of a perforated metal plate with projections for deflecting the heat on to the surface of the caramel. A firebrick slab is placed above the metal deflecting plate in order to conserve the heat. The appliance is generally made to accommodate slabs of sweetmeat 18 in. by 10 in. by 1 in. thick, but it can be constructed in other sizes to suit the individual requirements of manufacturers.

Drying Gum Goods.—Most confectioners have rooms in which they dry their gum goods. The drying operation is a lengthy one, varying from one to three days, with a maintained temperature of about 120° Fahr. Many of these drying rooms are heated by hot-water pipes or slow-combustion solid-fuel stoves. That gas can be used with advantage for this drying work will be seen from the following particulars of a case recently brought to notice. A drying room measuring 10 ft. by 10 ft. by 8 ft. was equipped with gas-fired air-heating stoves in place of the original slow-combustion solid-fuel stove. As a result it was found that more goods could be stacked in a room at one time, and that the drying of a certain amount of goods which was originally completed in 48 hours could be done in 36 hours, without any increase in fuel charges. Furthermore, the finished goods were brighter in appearance—an improvement of material value.

Bottle Washing and Drying.—Gas is now being used in a number of factories for heating the water for bottle-washing, and for drying the bottles quickly. One installation described by the author consists of a combined gas-heated boiler and hot-water storage cylinder from which supplies of hot water are drawn to fill the bottle-washing trough situated on the immediate left of the boiler. With the aid of this plant each boy or girl engaged in bottle-washing can clean 700 tins or bottles per working day, for the whole of his or her time can be occupied in actual cleaning operations. No cartage of fuel or stoking has to be attended to, as was the case originally when solid fuel was used. The hot water from the boiler is also used elsewhere in the factory for purposes other than bottle-washing, and, in consequence, a cylinder for the storage of clean hot water is provided.

In a somewhat different arrangement of the plant the hot water from the gas-boiler is used for bottle-washing purposes only, and the hot-water storage tank is eliminated; the water circulating direct between the boiler and the bottle-washing tank. In order to ensure economy in the consumption of gas, the boilers in both of these installations are fitted with a thermostatic valve which automatically cuts-down the gas consumption as soon as the water

in the cylinder (or bottle-washing tank, as the case may be) has reached the desired temperature. If hot water is not required for some hours during the day, the gas is turned off.

The bottle-drying apparatus consists of a sheet-iron box 6 ft. long by 3 ft. wide containing a series of flues heated from underneath by gas-burners. Air under pressure is passed over these flues and finds its exit (in a heated condition) through fifty tubes projecting from the top of the box. Over each of these tubes an inverted wet bottle is placed for drying. The apparatus deals with fifty jars at a time, and will dry 200 jars per hour with a consumption of 80 to 100 c.ft. of gas, according to the prevailing atmospheric conditions. Bottle driers can be built to deal with batches of 100 or 200 at a time.

In order to show the labour and time saving advantages of this plant, it may be mentioned that the original arrangement for drying bottles was as follows: After washing, they were sent up to the drying room, which was heated by means of solid fuel. They were left in this room for two or three days to dry before they could again be brought down to the bottle-filling department. With the modern system, fifteen minutes after washing, the bottles are dried and ready to hand over direct to the filling department—this, moreover, without the slightest risk of their being only partially dried. It has also been found that the new method of drying imparts to the bottles a better polish than the old.

Illustrations were also included in the paper of the use of gas for cocoa-bean and nut roasting, for the making of chocolates and fondants, and for drying lemonade powders. Mr. M'Lusky emphasized the cleanliness of gas, so important in connection with the confectionery trade, and concluded by declaring that "where gas is used in place of solid fuel in the sweet or chocolate factory it will tend not to increase, but rather to decrease, the cost of production."

Gas for Beer Boiling.

By William Wilson, M.S.E., Engineer and Manager, Burton-upon-Trent Gas Department.

The author gave particulars of the results of experiments carried out at the brewery of Messrs. Samuel Allsopp and Son, Ltd., Burton-upon-Trent, from April to September, 1920, when gas firing was substituted for the usual coal firing on the copper at their experimental brewery. Some doubt was at first entertained as to the possibility of applying gas to the boiling of beer, but no trouble was experienced at all at any time during the experiments. The normal capacity of the copper is 80 barrels (2880 gallons). The copper measured 11 ft. in diameter by 10 ft. deep, having an inverted bottom 7 ft. in diameter, with a rise of about 12 in.

Inquiries were made at several of the leading gas-furnace firms; but no suitable burners were available, having regard to the duty and consequent large hourly consumption of gas. The burners were therefore designed to give a proper bunsen mixture when passing the required quantity of gas. It was considered advisable to arrange the burners in such a way that there would be no structural alterations required to the setting of the copper. The burners were therefore easily removable, so that coal firing could be resorted to at any time.

The burners, which somewhat resembled organ pipes, were constructed as follows: The mixing tubes on the burners consisted of 4-in. cast-iron pipe. The burner was fitted with nine burner tubes made of 1½-in. wrought-iron pipe; the lengths of these tubes being adjusted to the curvature of the copper bottom. The orifice at the top of these burner tubes was reduced by means of a steam reducer 1½ in. by 1 in. (approximately 1¼ in. daylight orifice). Gauzes to prevent back-firing were inserted under these reducers; but owing to the tops of some of the burner tubes becoming hot, the gauzes were transferred to the base of these burner tubes. Five burners in all were placed below the copper; and experiments were made with low-pressure gas at 4-in. pressure, and high-pressure gas at 3 lbs. per sq. in. The gas-nipple when firing with low-pressure gas consisted of a 1 in. by ⅜ in. iron reducer; the size of the orifice being approximately ⅜ in. bore. When firing with high-pressure gas at 3 lbs. pressure per sq. in. this orifice was reduced to ⅜ in. brass; the idea of applying high pressure being to produce a shorter and fiercer flame underneath the copper, and to prevent any flame trailing round the side flues. The question of measurement of the gas was overcome by fixing a meter to one of the burners only out of the five when on low pressure. When on high pressure, the whole of the gas was metered prior to compression. When in operation, the furnace door was entirely removed, and the aperture left fully open. The flue damper was regulated only to remove the products of combustion. The waste gases were analyzed for CO_2, CO, and O_2; and the temperature of the waste gases was also recorded. A suitable pilot jet was used.

The actual boiling of beer was successfully and satisfactorily accomplished 36 times. The procedure adopted when boiling the wort (extract of malt) was as follows:

The wort commenced running in at 6 a.m.; the temperature being as near 145° Fahr. as possible. As soon as the copper bottom was covered, one or two burners were lighted, and the remaining burners were brought into action gradually. By the time the 80 barrels had been run in, which was generally about 9 a.m., the whole of the contents was boiling vigorously. Boiling was continued until a suitable quantity of the wort had been evaporated; the bulk being reduced from 80 to 70 (app.) barrels, usually about 1 p.m. A table is submitted showing the daily consumptions of gas and analyses of the waste gases.

Besides the above, several tests were made with a copper full of cold water, in order to arrive at the approximate efficiency of the burners; a known volume of the water being raised to boiling point, and the consumption of gas of a known quality to produce this result noted. The heat losses due to the absorption by the copper and surrounding brickwork were ignored; but owing to the copper being only used intermittently, it was felt that the heat losses through absorption by the brickwork would be considerably greater than if the copper had been in constant use. In every case the copper and the setting had to be heated up from cold. It was clearly demonstrated that as a result of the experiments there was no difficulty whatever in successfully boiling brewery coppers of this dimension with coal gas.

To make the project a commercial success it was found that, with the burner efficiency above, the gas would require to be supplied at a price below 2s. per 1000 c.ft. in order to give a fuel cost equivalent to coal. As it was impossible at that date to supply gas at this price, the experiments were suspended. At the time of the experiments the price of coal was 38s. per ton, and approximately 18 cwt. were required to effect the evaporation of 10 barrels. The fact that the bulk of the brewery coppers are situated at a considerable height above ground necessitates some expense in elevating and conveying coal, and removing the ashes, which in this case was done by means of wheelbarrows and a hoist. All this trouble was entirely eliminated by the introduction of gas, the rate of boiling was felt to be better under control and much more steady, and besides this it was felt that the wear and tear on the copper bottom, which in the usual course has to be renewed periodically at great expense, was reduced to a minimum. It was also considered that where a number of coppers could be adapted to gas firing the saving in labour would be considerable.

Within the last two months gas-firing burners have been fitted under the copper in Messrs. Bass & Co.'s model brewery. The copper in this case holds 20 barrels, and the burners are constructed on somewhat different lines. The mixing tubes of the bunsens are in this case also 4 in., but of wrought-iron tube. The organ-pipe type of small burner tubes is dispensed with, and the burner orifice is simply formed by a 4-in. wrought-iron elbow, having gauze inserted. Three burners are used, thus giving three large flames underneath the copper bottom.

The arrangement of flues in this copper, in my opinion, is not at all suitable for gaseous firing; there being too many inspection doors and dampers. The efficiency, therefore, of the burners is not as great as in the other case; but Messrs. Bass & Co. are delighted with the arrangement, particularly on the grounds of convenience and cleanliness. At present the author hopes that the question can be opened up again, for the Selas Turner Furnace Company have brought to his notice a burner which he believes will be satisfactory, and for which they guarantee an efficiency of 98 p.ct. These claims are being investigated. Should this burner prove satisfactory, it will be a commercial success.

Particulars re Daily Consumptions of Gas, &c. Gas-Firing Brewery Coppers.

Date.	Gas Consumption.	Contents of Copper.	Temp. of Flue Gases at end of Brew.	Pressure.
	Cubic Feet.	Barrels.	°Fahr.	
April 14	20,400	82	325	Low
,, 15	22,775	81	355	,,
,, 20	20,375	80	335	,,
,, 21	20,075	82	260	,,
,, 27	16,925	82	..	,,
,, 28	16,075	82	240	,,
May 5	18,800	80	250	,,
,, 10	21,700	80	290	,,
,, 12	20,325	80	240	,,
July 11	20,475	80	240	,,
,, 19	3,400	Experiment	185	High
,, 20	25,200	82 water	220	,,
,, 22	39,800	80	260	,,
,, 27	34,800	Experiment	190	,,
,, 29	35,900	80	225	,,
Aug. 4	25,150	80	295	,,
,, 5	39,015	80	260	,,
,, 11	22,250	80	295	Low
,, 17	21,000	80	..	,,
,, 18	19,510	80	..	,,
,, 19	18,965	85	250	,,
,, 20	21,775	85	240	,,
,, 24	25,800	80	280	,,
,, 25	23,700	80	280	,,
,, 26	27,400	80	285	,,
,, 31	24,030	80	260	,,
Sept. 1	17,900	79	260	,,
,, 7	23,785	80	230	,,
,, 8	26,985	79	265	,,
,, 9	25,640	79	255	,,
,, 13	19,760	79	290	,,
,, 14	21,340	80	285	,,
,, 15	19,800	105	285	,,
,, 16	21,900	79	280	,,
,, 21	24,560	87	250	,,
,, 22	24,340	80	260	,,
,, 23	21,000	78	285	,,
,, 29	25,600	86	250	,,
,, 30	24,560	78	270	High

Special Test on High-Pressure Gas at Allsopp's Brewery, Oct. 4, 1920.

Time of Test: 10 a.m. to 3.15 p.m. = 5¼ hours.
Gas Used: Meter Readings, 68,400 – 48,250 = 20,150 c.ft.

Time.	Temp. of Water.	Gas Consumption.	Time.	Temp. of Water.	Gas Consumption.
	° Fahr.	Cubic Feet.		° Fahr.	Cubic Feet.
10. 0 a.m. .	62	..	1.15 p.m. .	164	900
10.15 ,, .	70	1000	1.30 ,, .	171	900
10.30 ,, .	77	950	1.45 ,, .	179	900
10.45 ,, .	85	980	2. 0 ,, .	187	900
11. 0 ,, .	93	960	2.15 ,, .	192	1000
11.15 ,, .	102	960	2.30 ,, .	197	1000
11.30 ,, .	110	950	2.45 ,, .	201	950
11.45 ,, .	118	950	3. 0 ,, .	207	950
12. 0 noon.	125	950	3.15 ,, .	212	950
12.15 p.m. .	133	950			
12.30 ,, .	141	950		Rise in Temp. = 150° Fahr.	Consumption = 20,150 c.ft.
12.45 ,, .	149	1050	Totals.		
1. 0 ,, .	157	1000			

Water Heated: 80 barrels at 36 galls. each = 2880 galls. = 28,800 lbs.

Waste-Gas Analysis.

Time.	CO_2.	O_2.	CO.	Flue Temp.	Damper Opening.	Remarks.
	P.Ct.	P.Ct.	P.Ct.	° Fahr.	Inches.	
10.15 a.m. .	6·0	10·8	*Nil*	160	4	
11.10 a.m. .	6·4	10·6	*Nil*	200	4	11.30 a.m. damper reduced to 3 in.
11.45 a.m. .	7·0	10·2	*Nil*	215	3	
12.30 to 2.30	7·8	7·2	*Nil*	220	3	2.45 p.m. damper reduced to 2½ in. Tin placed over damper slot.
3.0 to 3.40 .	8·8	6·2	*Nil*	235	2½	
3.45 p.m. .	9 4	5·8	*Nil*	235	2½	

Costs and Efficiency.

Heat generated by gas at 430 B.Th.U. net = 20,150 × 430 B.Th.U. = 8,664,500 ,, ——A

Heat accounted for by water (heated from 62° to 212° Fahr.) . . . . . = Wt. of water × rise in temp. = 28,800 × 150 B.Th.U. = 4,320,000 ,, ——B

Thermal efficiency, $\frac{B}{A} \times 100$ . . . . . = $\frac{4,320,000}{8,664,500} \times 100$ = 49·9 p.ct.

Cost for heating 2880 galls. water from 62° to 212° Fahr. . . . . = £3 15 7 (gas at 3s. 9d. per 1000 c.ft.)

Cost for heating 36 galls. (*i.e.*, 1 barrel) from 62° to 212° Fahr. . . . . = 0 0 11½

Cost for heating 2880 galls. water from 140° to 212° Fahr. . . . . = 1 19 7

Cost for heating 36 galls. (*i.e.*, 1 barrel) from 140° to 212° Fahr. . . . . = 0 0 6

Cost of gas per hour (average consumption 3838 c.ft.) . . . . . = 0 14 4½

Special Test on Low Pressure Gas at Allsopp's Brewery. Thursday, Oct. 7, 1920.

Time of Test: 9.45 am. to 2.30 p.m. = 4¾ hours.
Gas Used: Meter Readings, 88,370 – 70,770 = 17,600 c.ft.

Time.	Temp. of Water.	Gas Consumption.
	° Fahr.	C.Ft.
9.45 a.m.	60	
10. 0 ,, ...	68	
10.15 ,, ...	75	1630
10.30 ,, ...	83	
10.45 ,, ...	92	1800
11. 0 ,, ...	100	
11.15 ,, ...	109	1750
11.30 ,, ...	118	
11 45 ,, ...	126	1950
12. 0 noon . . .	136	
12.15 p.m. . . .	145	1950
12 30 ,, ...	154	
12.45 ,, ...	163	2050
1. 0 ,, ...	170	
1.15 ,, ...	178	1750
1.30 ,, ...	186	
1.45 ,, ...	192	1800
2. 0 ,, ...	198	
2.15 ,, ...	204	1800
2 30 ,, ...	212	1200
Totals	Rise in Temp: 152° Fahr.	Gas Consumption: 17,600 C.Ft.

Water Heated: 81·5 barrels at 36 galls. each = 2934 galls. = 29,340 lbs.

Waste-Gas Analysis.

Time.	CO_2.	O_2.	CO.	Flue Temp.	Damper Opening.
	P.Ct.	P.Ct.	P.Ct.	° Fahr.	Inches.
10.30 a.m.	9·6	5·2	*Nil*	185	2½
11.10 a.m. to 11.50 a.m. .	9·8	4·6	*Nil*	205	2½
12 noon to 2.30 p.m. .	9·2	3·8	*Nil*	230	2½

NOTE.—The damper was reduced momentarily to 2 in., but too much back pressure was produced. The damper opening of 2½ in. appears to give the minimum working pull.

Costs and Efficiency.

Heat generated by gas at 470 B.Th.U. net . = 17,600 × 470 B.Th.U. = 8,272,000 ,, ——A

Heat accounted for by water (heated from 60° to 212° Fahr.) . . . . . = Weight of water × rise in temp. = 29,340 × 152 B.Th.U. = 4,459,680 ,, ——B

Thermal efficiency, $\frac{B}{A} \times 100$ . . . . . = $\frac{4,459,680}{8,272,000} \times 100$ = 53·9 p.ct.

Cost for heating 2934 galls. water from 60° to 212° Fahr. . . . . = £3 6 0 (gas at 3s. 9d. per 1000 c.ft.)

Cost for heating 36 galls. (*i.e.*, 1 barrel) from 60° to 212° Fahr. . . . . = 0 0 9½

Cost for heating 2934 galls. water from 140° to 212° Fahr. . . . . = 1 15 8

Cost for heating 36 galls. (*i.e.*, 1 barrel) from 140° to 212° Fahr. . . . . = 0 0 5

Cost of gas per hour (average consumption, 3705 c.ft.). . . . . = 0 13 10½

Gas for Fish Frying.

By HARRY CLARK, Distribution Superintendent, Derby Gas Light and Coke Company.

The fried fish catering business, said the author, has grown to enormous proportions. In the area of supply of his own undertaking, for example—which covers 100 square miles—there are now nearly a hundred fish shops which probably sell an average of 15 cwt. of potatoes and 30 stone of fish each per week, or roughly a total of 4500 tons of fish and potatoes per year. But the business has not only increased in size; it has improved its status. A new class of patron has created a demand for a much higher class of shop, and greater attention to the grade of the food supplied. The insistent and increasing demand on the part of the general public for absolute cleanliness in this as in every class of food preparation is a consideration which cannot fail to convince even the die-hards of the obsolete "coal school" that they have backed a loser. The modern gas frying range more than meets every demand in this direction; while coal ranges are found wanting to a lamentable degree.

In addition to cleanliness, the fried fish and potato consumer requires that the food shall be cooked properly and be palatable when eaten, and not soddened with fat or oil. This is ensured with a gas-range, because the correct temperature of the fat or oil is obtained by simply turning the tap lower or higher as required, which obviously cannot be done with the old-fashioned coal furnace. A further development of the gas-range is a scientifically designed temperature control, which automatically maintains the correct temperature of the frying medium.

Another important requirement is that the fish and potatoes shall be properly cooked in as short a period as possible. It will be recognized that this is of great importance to the caterer as well as the purchaser. When it is realized that a panful of chipped potatoes may be ready for serving over the counter within ten minutes from lighting-up when a modern gas-range is used, it is clear that the fish caterer who is subjected to intermittent rush periods is freed by gas from all anxiety. It is a worthy achievement for the gas-heated frying range that it meets the varying demands of an impatient public, and yet satisfies the shrewdest frier.

The reduction in labour which gas service affords must also appeal strongly. The term "longer hours" is usually disturbing; but when a gas-fired range is used the interpretation is "longer hours rest"—for the range need not be lighted until ten minutes before opening the shop. At the finish of the day's work, too, when the gas is turned off, an all-steel or tiled range may be cleaned-down in a few minutes ready for the next day, without the drawing of unburnt coal and its attendant dust, dirt, and danger of fire.

Another important point for the frier is the drop in temperature of the fat or oil from 370° or 380° Fahr., which is the usual frying temperature, to about 270° Fahr. when the potatoes are placed in the pan. The ease and certainty of regulation by hand or automatic control in the gas-range have already been pointed out. Owing to the impossibility of such regulation with a coal-range enormous quantities of fat or oil are wasted. In fact, the saving in the frying medium amounts nearly to the cost of gas used in the gas-fired range. To give one instance: With coal, 210 lbs. of fat were used; with gas, 148 lbs. were used at 50s. per cwt.—showing a saving of £1 7s. 8d. in the cost of the fat. The modern gas-fired range meets all the requirements of the sanitary authorities in connection with the operations of the Offensive Trades Act.

The 4500 tons of fish and potatoes annually cooked in the district of the Derby Company were until recently dealt with over coal fires in ranges resembling glorified wash-coppers—iron pans in brick-built furnaces. Experience has proved that it is not advisable to convert such coal-fire ranges by fixing bar burners, chiefly because of the great loss of efficiency and the extra cost of gas. The installation of specially constructed gas fish ranges is always preferable. In the construction of these ranges no brass or copper should be used, not only because the presence of these metals adds to labour, but because they are a source of danger of food contamination, as it is impossible to avoid the formation of verdigris at some time or another. Careful and im-

partial tests have been made of the various ranges on the market, and gas undertakings are in a position to give reliable advice to caterers in making a choice between them.

The type of gas-burner is important. In actual practice, the efficiency of the most satisfactory burners is from 50 to 60 p.ct.; and with the type which Mr. Clark regards as the best, exceedingly good results are obtained. The burner is designed to consume 90 c.ft. of gas per hour at 25-10ths pressure. Commencing all cold, it is possible to serve perfectly cooked food in from 8 to 11 minutes from lighting-up.

The use of oil fuel is being advocated in certain quarters as superior to gas fuel; but actual experience suggests that "the wish is father to the thought." Oil-ranges are certainly in advance of the dirt creating coal-range; but when compared with a modern range solely designed for gas fuel, the comparison is all in favour of the gas-fired range. Fish restaurants are not often commodious premises; and when oil burners are used, there has to be space for the storage of oil, and a high-pressure oil cylinder with pump fixed near the range. The cylinder is connected by tubes to the burners, which are more or less complicated in design, having a needle regulator used for cleaning the injector nipple; and incidentally there is the possibility of oil flooding in the process. As this often has to be done during the period of frying, it is apparent that the possibility of tainting the food is no mere bogey. With regard to electrically-heated ranges the initial cost, running charges, and renewal of heating elements obviously limit their use to those having "money to burn."

As to gas-cooking costs, it is impossible to give any but approximate figures, as the factors vary in every town and almost in every shop. The price of gas, its pressure, and calorific value, have of course to be considered, as well as the proportion of fish and potatoes cooked (potatoes require more heat than fish); for the proportions vary from equal quantities to 7 to 1. The human element must also be taken into account—a very important item in the use of all gas apparatus. Exhaustive tests in the Derby Company's district have, however, proved that the average cooking (fuel) cost with the best gas ranges is 1¼d. per stone of fish and potatoes. This is a figure not likely to frighten anyone against the installation of a gas fish frier.

Discussion.

The CHAIRMAN (Mr. F. W. Goodenough) said he was sure those who had heard the papers concerning the multitudinous uses of gas would begin to realize the truth of the remark that gas was of use to man from his cradle to the crematorium. If the gas supply of the community were suddenly to fail, people would be astonished to find the extent to which they were inconvenienced by the loss of it.

Mr. ROBERT WATSON (Doncaster) proposed a hearty vote of thanks to the authors. Everyone, whether a gas engineer or a member of the public, must have been interested in the papers. The Chairman had mentioned that people scarcely realized the extent to which they were dependent upon gas for almost all their catering. Some four years ago, he had an experience of this at Doncaster. Through some labour trouble, the town was absolutely without gas for four weeks; and though he prided himself upon knowing something of the extent to which gas was used in every direction, he never realized so fully as he did during those weeks how every individual in the town was dependent upon gas, in some form or other. His town was not only famous for its races, but for its butterscotch—just as Mr. M'Lusky's town was noted for its toffee. He had found that the manufacturers of butterscotch used gas extensively, through high-pressure burners; and it paid them to do so. He should like to add that one important butterscotch manufacturer was at the time Chairman of the Electricity Supply Department; and yet he came to the Gas Department for lighting his establishment, as well as for making his butterscotch.

Mrs. CLOUDESLEY BRERETON seconded the vote of thanks. The preparation of food in an economical manner in restaurants was, she said, just as much of interest to women as citizens.

Mr. S. B. CHANDLER (Tottenham) said, with regard to gas for fish frying, in the district which he represented considerable progress had been made recently in the adoption of gas for this special purpose and the removal of the coal or coke fire-ranges. As they knew, fish frying came under the Offensive Trades Act. They had induced the local Council, when granting licences for carrying on the trade, to advocate or press the claims of gaseous fuel as against solid fuel, on the score, first, of the importance of smoke abatement, which was a conclusive point.

Dr. C. M. WALTER (Birmingham) remarked that, in connection with caramel toasting, Mr. M'Lusky had described the apparatus as having a metallic reflector plate with a firebrick slab above it. He should like to ask whether the author had tried the effect of introducing between the metallic plate and the flame some ceramic material, with a view to increasing the efficiency of the apparatus. This applied also to the gas-heated appliance for drying lemonade powder. Their experience of iron slabs heated by flame contact was that a much higher efficiency could be obtained by the introduction of a firebrick between the slab and the flame. With regard to Mr. Wilson's paper on beer boiling, the results obtained were very creditable. Was the combustion chamber similar in the low-pressure experiment to that of the high-pressure system?

Mr. M'LUSKY had no doubt Dr. Walter's suggestions would greatly improve the apparatus. He did not design it, but had just taken it as a faithful representation of what had been done in this direction.

Mr. W. WILSON explained that there was no change made in the combustion chamber when applying for fixing to the copper at the experimental brewery. It was not thought desirable to make any structural alterations.

Mr. H. R. HEMS (Birmingham) fully endorsed all the advantages that Mr. M'Lusky had mentioned in connection with the use of gas for sugar boiling. It appeared to him that Mr. Wilson could have obtained much better results if he had built a setting to suit the shape of the container. Did he understand Mr. Clark aright, that the old brick-built furnaces had been done away with in applying gas firing to fish frying? If so, he thought the same remark would apply as in the case of the beer boiling.

Mr. CLARK replied that the old brick-built furnaces had been removed. They had not received suggestions for altering the construction of the ranges; neither had they had any complaints. It rather suggested that the consumers were finding the change satisfactory.

Mr. WILSON said they gave the question of altering the brick work considerable thought; but they were there largely on sufferance, and did not want to put the brewers to too much trouble and expense. In the circumstances, he thought the degree of efficiency was fairly high. They made use of the existing heating chamber of the copper, without any structural alterations.

The CHAIRMAN said he hoped the members of the public present that afternoon would carry away with them an impression of what was true—that the Association, and the gas industry as a whole, devoted a great deal of their time, and were largely organized, for the purpose of securing for the public the very best results from the use of gas. The gas industry believed that its prosperity depended upon the public getting the maximum results from the minimum cost. He could testify to the growing use of gas for sugar boiling in London. They were converting coal-fired appliances to gas-heated ones almost every day; and they expected to wipe out solid fuel altogether for use in the confectionery trade. With regard to this latter, their largest customer in London was a firm of caterers of world-wide repute, who used about 300 million c.ft. of gas per year; and their consumption was going up all the time. They would not be buying this quantity of gas if they were not getting value for it.

CITY AND GUILDS GAS SUPPLY EXAMINATIONS.

The following is the report on the 1923 City and Guilds of London Institute Examinations in Gas Supply, to which reference is made in the report on p. 133 of the Council meeting on the 1st inst. of the Institution of Gas Engineers.

	No. of Candidates.	First Class.	Second Class.	Fail.	Percentage of Failures.
Grade I.	237	63	97	77	32·5
Final	101	43	44	14	13·85
Total	338	106	141	91	26·9

The order of popularity in which the questions were answered is as follows:

GRADE I.

Question No.	Subject.	Totals.
1	Defects in main pipes	237
2	Mainlaying	228
3	Geysers	208
4	Meters	192
5	Lanterns	185
6	Gasfitters' tools	149
7	Consumers' governors	142
8	Solders	130
9	Prepayment meters	78
10	Main pipes	51
11	Gas-burner efficiencies	40
		1640

FINAL.

Question No.	Subject.	Totals.
1	Installations in cottages	97
2	Maintenance	94
3	Remodelling old pipes and fittings	77
4a	Spraying gas-meters	75
4b	Gas-fires	75
5	Pole's formula	62
6	Illumination of rooms	53
7	Standard meters	48
8	Meter cocks	44
9	Illuminated signs	29
10	Hotel, &c., sub-meters	26
11	Law on mainlaying	24
12	Spun main pipes	20
13	Meter-testing regulations	19
14	High-pressure main capacity	13
15	Gas-cookers	11
		767

The average number of questions answered by candidates in Grade I. is 6·9, and in the Final Grade 7·6.

Many of the papers in Grade I. indicated want of preparation or insufficient knowledge of the whole range of subjects included in the syllabus, as shown by the average questions attempted being below seven. Some of the candidates only attempted five or six questions; and of these, three or four were usually very good answers. The total marks obtained in such a number however, did not warrant a second-class pass.

Some of the candidates on the border lines of success could have obtained second and first class passes easily, had they read the questions carefully and answered the whole. Most of them omitted the explanations and reasons asked for, and even the second half of the questions, entirely. This particularly applies to Questions 4, 6, 7, 8, and 10. There is no reason to doubt that the greater number of these candidates knew the complete answers; but as they did not state them in their papers, full marks could not be given. The standard of general knowledge

shown by the other papers was high, and a few papers were excellent; so that a careful scrutiny was necessary before awarding the prizes.

In the Final Grade, the work of the candidates showed a very marked improvement on the previous two years' work, and reflected great credit on the teachers and candidates; the number of failures being much below the average. The same remarks as to partial answers apply here, as in Grade I., particularly so in Questions 1*b*, 2*b*, 3*b*, and 8. With fuller replies, the number of first and second class passes would have been greater.

The sketching by many of the candidates was excellent; but a considerable number either omitted sketches altogether or made them so badly that it was impossible to judge of their knowledge of details. More practice in sketching is required by students in the course of their class and home work.

The Final Grade paper was in one respect an experiment, since it was designed to find out how many of the candidates might aspire to be administrators, chiefs in distribution departments of large undertakings, or outdoor superintendents in small undertakings, and how many would be likely to be only chief inspectors or sales managers for gas fittings and apparatus in smaller undertakings. The answers showed clearly that the majority of the candidates would fall under the second class; but the few candidates who attempted the questions for the former class were evidently acquainted with their duties, and, speaking generally, obtained the highest percentage of passes.

YORKSHIRE JUNIOR GAS ASSOCIATION.

MR. HOLE EXPLAINS THE EDUCATION SCHEME.

A Special Meeting of the Yorkshire Junior Gas Association was held on Sept. 20, at the showrooms of the Bradford Corporation Gas Department, to hear an explanation of the new education scheme of the Institution of Gas Engineers, by Mr. Walter Hole. In the unavoidable absence of the President (Mr. H. L Bateman, of Wakefield), the chair was occupied by Mr. W. HEATHCOTE, of Halifax (Vice-President). Among those present was Mr. J. Bridge (Elland), one of the Junior representatives on the Advisory Committee.

Mr. HOLE outlined the scheme (as explained previously in the "JOURNAL") in detail, and enlarged on various points on which he had been asked questions at other gatherings at which the proposals had been discussed. At the outset, he said he would specially remind his hearers of the double-barelled nature of the scheme. There were really two schemes running side by side—one for the student who had the advantage of institutional facilities in his own district, and the other for the less fortunate men (who were in the majority) who had no such facilities, and would have to undertake a certain amount of private tuition or reading. The serious need for some definite educational scheme by the Institution was shown by the fact that, while in 1913 there were 27 technical institutions which included gas subjects in their curriculum—and even those were almost entirely limited to London and Yorkshire and Lancashire—there were now, he believed, only 11 taking such subjects.

One point about which there seemed to be a good deal of misunderstanding was in regard to the higher diplomas. There appeared to be an impression that there was one diploma only, whereas there were two, quite distinct, for gas engineering and gas supply. Some people had questioned the wisdom of the age limit of 23 years, which had to be attained before a student could secure the diploma. It was intended that the diploma should be not only one of academical knowledge, but also one certifying experience and practical ability to deal with the many problems and emergencies which were likely to arise—and did often arise—in ordinary gas-works or gas-supply practice. It was held, and he thought quite justifiably, that a man could not have had this experience before the age of 23, by which time the student would have had a certain number of years' work in the industry. There had been a certain amount of criticism on the point of general education; but he thought it would be generally agreed that a man applying for his certificate really must have a reasonable standard of general education, and for this reason the Committee had fixed a standard equivalent to that of the matriculation standard of any approved British University. Surely this was not an unreasonable standard, when one remembered that in a good secondary school to-day a youth could take his matriculation at the age of 16. Another requirement was that the student, at least one month before sitting for the examination, must have written and submitted to the examiners an original thesis on some aspect of gas-works practice, construction, plant, or on some point in connection with his daily employment, if he was an engineering student; or if a gas-supply student, a paper on some feature in connection with supply, distribution, or the utilization of gas. The question then arose, "What is an original thesis?" He had had this question put to him several times. It was, obviously, not essential that the thesis should comprise original research work. Such a requirement would cut out everybody except the man who was advantageously placed in regard to facilities. It did not mean the man who would memorize a few pages of some learned work, and would merely reproduce that work in his own words. The paper must have two elements. It must show independent thought and an application of the critical faculty. It must not be merely a good description, but a study. This was, to his mind, a most important factor of the scheme, because it meant that a young man must exercise his full powers of observation long before he sat for the examination. This would be all to the good of the man himself, all to the good of the undertaking which he served, and all to the good of the industry as a whole.

He had been asked, "Why was an oral part introduced into the examination?" Well, this was deliberately designed to cut-out the man who merely read-up his subject. It was not fair to the industry that men should be certificated unless they had practical knowledge. It had always to be remembered that, in a written examination, a man—especially a highly-strung person—did not necessarily produce his best work. The oral examination gave him the opportunity to put anything right which might have been rather badly expressed on his papers. As an examiner himself, he knew that there were men who knew the subject, and had the right idea, but, either through nervousness or through lack of the ability to express themselves in writing exactly as they intended, did not answer the questions in the right way. The oral examination was a safeguard both for the student and for the Institution. The syllabus for the diploma in gas engineering had been prepared by Mr. Samuel Tagg, of Preston, who had been an examiner, but was not one of the examiners at present. The syllabus had not yet been published; but he could give an outline of it. The questions would be based on the syllabus for the ordinary examination, but of an advanced nature, demanding a more exact knowledge of, and experience in, the subjects. There would be questions involving chemistry and physics, to prove that the student possessed an advanced knowledge of the principles and processes and their application. The student must be shown to possess a better knowledge of the design and construction of all plant usually employed in gas manufacture, and he must have had experience in the working of such plant. The diploma syllabus in gas supply covered a far wider range of subjects; a knowledge being required of the flow of gas in mains (theory and practice), mainlaying costs, electrolysis and electric fusion, flame temperature and propagation, principles and measurement of illumination, combustion in its various forms, furnaces for industrial uses, refractory materials, influence of and remedies for inconstant mixtures, testing of temperatures, working results, testing of fires, cookers, and other gas appliances for thermal and hygienic efficiency, general legal obligations in distribution and supply, relative fire risks and effect on insurance rates, and important developments of general interest in any matters relating to gas supply such as have been fully described in the Technical Press, &c.

Recently he had had the privilege of being shown round the Technical College at Glasgow, where they had more than 5000 students undergoing tuition of a very high order, and the Manchester College of Technology, where they had some 11,500 students. When he saw these two places, and thought of all that could be done by technical institutions in various parts of the country, he was a little depressed, because he felt that the gas industry did not seem to realize to the extent that it was realized in some other industries the absolute necessity for very much higher technical instruction than obtained generally in the industry at present. He almost felt that if they were not careful in the gas industry, they were likely to be left behind in the race. Competition was keen to-day; but if the signs of the times portended anything at all, he thought they showed that competition in the near future was going to be far more intense. This condition of things, together with a very great development in the application of science to the various processes on the works and in the district, and in utilization, meant that, if the industry was to prosper and fill its proper place, it must keep itself fully abreast of the times. As individuals, they must not miss the larger aspects of the industry in their own concentration on the details of their daily work. There was, he was glad to know, growing up in the industry a sense of this need. Administrators recognized it, and were increasingly willing to encourage technical training, and to help to afford facilities for the higher education of those engaged in the gas industry. He believed administrators would do their part; but they demanded—and had a right to demand—knowledge and skill. Certainly he agreed that men in the industry should get an automatic increase of remuneration as their qualification increased. He hoped to see an automatic increase of remuneration to the men as they got the higher certificates. This would be justified on ethical grounds because the employer would have better service, and on technical grounds because the employer through that better service would get his own back again. It was the man who "knew" who was going to be the most valuable to his employers, and to the industry as a whole.

Discussion.

The CHAIRMAN said the industry would be the richer if it had men at the head of affairs who possessed the knowledge and experience which enabled them to get the diploma of the Institution of Gas Engineers. He was very glad to hear Mr. Hole's observations on the subject of added remuneration for men of proved practical ability. It should be incumbent on the Institution to see that gas committees and boards of directors had definite means of recognizing ability.

Mr. J. BRIDGE thought that very possibly many members of the Junior Associations would have difficulties in their efforts to gain the diploma; but the Advisory Committee was composed of men of ordinary common sense, who would take a very sympathetic view of the situation. Regarding the matriculation standard of general education which must be passed before sitting for the diploma, he understood that, for the time being, the Advisory Committee would consider cases where members of the profession had not actually passed an examination in that standard, and might not even have got the higher

school certificate. In bringing about new requirements regard must, of course be paid to the position of men already in the profession who had no opportunity to pass the tests set for the youths still to come into the industry or who were only young in it; and if there were members in such a position desirous of taking the diploma course, the Advisory Committee could consider their applications very leniently. But on the expiration of a few years the matriculation standard would be compulsory. For the older members there was a chance to get through without it; but for the younger men, now was the time to start preparing for the examination. In regard to the thesis to be submitted before the examination, it was as well to mention that, if a member had submitted an original paper to his Junior Association, this might be forwarded to the examiners as his thesis. The junior who passed his examination under the Institution would immediately have the hall-mark of qualification. He (Mr. Bridge) wondered whether when a man had gone through all the experience and preparation necessary to secure the diploma, it could not be regarded as a qualification for membership of the Institution of Gas Engineers. Such membership, based on the qualification, would be something of which every man would be proud. When the suggestion came before the Institution, he believed Mr. Hole would lend it his sympathetic support, and it was up to the Juniors to show the Institution that they were ready to accept such a qualification of membership. There was one matter upon which Mr. Hole had not touched, and this was in regard to the expense to which a student was put in attending a technical school several nights per week—after the day's work—for three or four years. This involved not only time and labour, but also some money, probably in many cases, in travelling. The Directors of the undertaking in which he (Mr. Bridge) was engaged had very generously agreed to meet such expense to students who put in 75 p.ct. attendance at the classes and secured 60 p.ct. of the homework marks. If they did not have their expenses paid the first year, it was very likely they would the second year, when the employers had seen what good work was being done. It was deplorable to think that at present in more than half the country there were no classes at all in gas subjects. The difficulty in many cases, he was sure, was largely due to the students of the industry not making application for classes to be formed. If there were no classes in a district, it was up to the students of that district to write to Mr. Hole; and he would do everything in his power to get classes formed, either in the district or in an area which could be shared by several districts.

Mr. HOLE, when asked whether the Advisory Committee could not do anything to alter the position under which there were now only 11 technical institutions giving gas subjects, as against 27 in 1923, said the Committee could do a great deal if the students would let them know there was a sufficient number in a district to warrant the formation of a class. If there was not enough in one district, the Committee would do their best to arrange a system of grouping of districts which could share a class. He hoped juniors would communicate direct with him, or through their Association Secretary—if they would rather do it that way—giving names and addresses and what particular classes were needed. He was glad Mr. Bridge had referred to the discretionary power in the hands of the Advisory Committee; and was quite sure this power would be applied very sympathetically. The Committee were so fully representative that they were able to make modifications, where desirable, which could not otherwise be made. He was also glad Mr. Bridge had referred to the original thesis being a paper which might be one prepared for contribution to a Junior Association. The examiners would be prepared to accept such papers, if they showed independence of thought and the critical faculty.

Mr. W. INESON (Bradford) asked whether the age limit of 23 was not likely to cause difficulties to the man who had passed his City and Guilds when he was 18 or 20, and now wished to enter for the certificate in the final grade. Would such a man have to take the course over again, simply because there had been a few years intervening between his passing the City and Guilds and his reaching 23 years of age?

Mr. HOLE drew attention to the provision of a five years' transition period, which was intended to allow for such and similar cases. For five years a first-class final certificate under the City and Guilds would be considered the equivalent of the higher certificate under the new scheme. A man must possess the higher certificate under the scheme, or its permitted equivalent, before he could go forward for the diploma. He must possess the first-class City and Guilds or, under the new scheme, he must have passed both in gas engineering and gas supply.

Mr. T. N. JACKSON suggested that, with a view to the formation of new classes, the syllabus, when issued fully, should be circulated by the chief engineers to all departments of the works and the district, and that meetings be arranged in the works, where the whole thing could be explained to the staff and employees. If the chiefs could see their way to help with regard to expenses, let the men be told so. It was essential that all should know of the scheme, and by such means he thought probably many classes would be formed which would otherwise not be.

Mr. HOLE said this was an excellent proposition; and he believed in most cases they would find the chief very sympathetic. By calling such a meeting they would be doing a valuable piece of work for the scheme and for the industry. It must be remembered that they must draw into the scheme not only the members of the Junior Associations, but also the young men who were in the first stages of the work, and were not yet members of the Associations. He hoped the suggestion would be taken up very generally.

Mr. P. M'NAB (Low Moor) asked whether there would be any means of men up to (say) 45 years of age getting the diploma, either in an honorary manner or by some allowance for the years of practical experience they had had and the modern schooling which they could not get. These men had been "through the mill," and must be well versed in the practical side of the industry, or they would not hold their present positions. Was it essential that if they wished to get the certificate or the diploma, they should go through all this special training, or would there be a few years allowed for men who had done valuable work for the industry?

Mr. HOLE: I think it is unlikely that any diploma will be granted which is not actually earned. We cannot throw diplomas about, even to men who have done good service for many years. Suppose such a man twenty years ago got a first-class City and Guilds in engineering and a first-class in gas supply later on, there is no limitation of time in the note at the foot of the scheme. It does not say when the City and Guilds, which will be recognized during the next five years, must have been secured. There is a slight ambiguity in this matter in the scheme which might lead to misconception; and in the next issue it will be made clearer, showing that it covers any City and Guilds successes prior to 1924.

Mr. JACKSON: Mr. Hole has made no mention of any financial knowledge requirement with regard to a gas undertaking; but he would agree, no doubt, that a certain amount of such knowledge is necessary to the man who holds any responsible post.

Mr. HOLE said this was so; but, as a matter of fact, it was covered by the new "B.C.G.A." commercial course, which included finance, salesmanship, &c. Any gas engineer in charge of an undertaking must obviously possess not only his technical diploma, but also a knowledge of management of men, finance, and various other qualifications, including the commercial instinct and commercial experience. The only point on which the Institution scheme touched on such matters was in the requirement as to legal obligations as they referred to gas supply. The need was being fully met in the "B.C.G.A." course.

Mr. HOLE, in answer to a member who asked whether an idea could be given as to the time occupied by the examination, said the application must be in by Dec. 31. The written part took place about the beginning of May or the end of April; and the original thesis must be in at least a month before that time. The oral part was within three weeks of the written part.

Mr. MORTIMER (Brighouse) asked in regard to the ancillary subjects in gas engineering, and where tuition would be obtained.

Mr. HOLE replied that throughout the scheme it had been the endeavour to use existing classes; and therefore a certain amount of discretion had had to be conferred on the Principals of the technical colleges. A report drawn up by a representative of the Board of Education on the Advisory Committee had been sent to the Principals of the institutions, suggesting certain courses and asking the Principal to draw up his own scheme, with the report as a guidance, and send it to the Board of Education and the Advisory Committee for approval.

Mr. R. W. WEBB (Leeds) referred to the question of the present session, and the City and Guilds Examination at the various technical training centres. What he had in mind was—if there were sufficient students to arrange for classes, would these students have to lose a year before being examined? Remarking on the question of youths in the country areas, where the town facilities were not available, Mr. Webb said obviously the ideal was that they should have equal facilities with the young men of big towns, though in many instances this was practically impossible. The matter of outside or private study must be the salvation of the situation. Regarding the diploma examination, Mr. Webb remarked on the subject of costs, contending that it was a very difficult thing in many cases for the junior to get any information regarding costing. He considered that for a young man of twenty-three to obtain the diploma was a very fine step. It would do a lot to eliminate the men who were square pegs in round holes; and furthermore, in the future the status and remuneration of the men who gained the diploma would be greatly improved, besides improving the relationship between the junior and his superiors. If at the age of twenty-three a man could obtain this diploma by satisfying the examiners, surely this should entitle him to membership of the Institution of Gas Engineers. If a man was held back until he obtained a position of management, years might elapse—years in which the man's brain might become dormant, whereas it could be at the service of the Institution if membership were granted when he gained his diploma.

Mr. BRIDGE complimented Mr. Webb on his remarks, and said that as regarded costing, if taken literally, it would be considered at the oral examination. Therefore discretionary powers should be applied at the oral examination, because it could hardly be expected that the student from the small works would have the same amount of specialized experience in some part of a plant as (say) the student from a large works. On the other hand, the man from the large works might not have had the more general experience which came from the varied duties of the man on the small works.

Mr. HOLE said the question of costing had referred only in relation to mains. It was not an unreasonable suggestion, he thought, when they weighed up what it meant. It was a profit and loss account which any young man of twenty-three should be able to work out, and by this means ascertain if the laying of a particular main would be a business proposition. He agreed with Mr. Webb that in many instances it was not possible for a junior to obtain the more intricate figures in connection with costing (say) for a new vertical installation. This was not, however, in the scheme, and therefore the question of costing as laid down was not of a serious nature. Speaking generally on the scheme, Mr. Hole said that a great advantage was that nobody was cut out; a ladder was provided leading from the smallest works to the finest certificate the industry could offer. Regarding the present session and the City and Guilds examination, he would like to say that the City and Guilds were a teaching and not an examining body; they brought in an outside body for examination. Students, said Mr. Hole, should have adequate remuneration. Service was an ethical relationship. There were two sides. On the one hand, the servant should be prepared to give his very best to his employer, and, on the other hand, the employer should adequately and fairly reimburse the servant for the service obtained. The man who was technically trained was of far more value than the man not technically trained; and the difference in service rendered should be shown by a difference in status and salary. As to examiners, Mr. Hole agreed that it was unfair to impose questions on subjects with which the student had never had a chance to deal. This applied particularly to the oral examination; and in this connection the examiners would have to show discretionary powers.

Mr. HEATHCOTE mentioned the question of the gasfitter, and asked whether, if the City and Guilds turned down the gasfitting examination, the Institution of Gas Engineers would take it up.

The meeting terminated with votes of thanks.

THE REGENERATIVE COAL GASIFICATION SYSTEM.

A Process for the Complete Gasification of Solid Fuels.

By Morris W. Travers, D.Sc., F.I.C., F.Inst.P., F.R.S., and Frank William Clark, M.I.Mech.E.

(*Concluded from* p. 37.)

Theory of the System.

32.—The first stage in the investigation, the practical outcome of which has been dealt with in the first part of this paper, consisted of careful survey and analysis of all reliable data relating to the carbonization of coal and the manufacture of water gas. In particular we made use of the results of the experiments carried out by Prof. J. W. Cobb, C.B.E., in connection with the Institution of Gas Engineers, by the Fuel Research Board, and by the American Bureau of Mines; and to those authorities we tender our acknowledgments.

33.—The process we are considering can be dealt with as if it were carried out in two separate stages. In the first stage, the coal is carbonized by direct contact with the hot water gas and the circulation gas flowing through it. In dealing with this part of the process, we were obliged to make certain assumptions upon which to base our calculations. We assumed, in the first place, that a ton of dry coal, the unit quantity of material considered, yielded on carbonization 0·65 ton of coke. As there is no loss whatsoever on passing from the carbonization to the gasification process, this estimate is on the low side. The gasification of the coal requires that the coke produced in the process shall reach the bottom of the carbonization zone at a temperature between 800° and 900° C. At the latter temperature, under the conditions obtaining in the plant, gasification would probably be almost as complete as in ordinary vertical retort practice when steam is used, as the material is subject to the direct action of a stream of hot gas, and the early stages of distillation must be completed high up in the carbonization zone. Heating of the material to a higher temperature in the carbonization zone is to be avoided, as this would lead to the destruction of the hydrocarbons contained in the circulation gas, and to the lowering of the calorific value of the product. The gas leaving the top of the fuel bed in the gas producer must, of course, fluctuate in temperature according to the length of time after charging the generator with coal. In our preliminary estimate we assumed that this temperature would average 400° C., which agrees fairly well with the result obtained in practice. On the basis of these assumptions it was possible to work out an estimate of the quantity of heat required to carbonize the fuel.

34.—In the second stage of the process the coke is gasified, the process differing from the water-gas process as usually operated, in that the coke is supplied to the system hot. The temperature in the lower part of the gasification zone will vary in the neighbourhood of 1300° to 1400° C.; the highest temperature obtaining at the end of the blow period, and the lowest at the end of the run period. Owing to imperfect heat interchange, the gas must leave the top of the gasification zone at a temperature higher than that of the coke entering it.

35.—We may regard the heating of the circulation gas as a separate process. Here we have to take into consideration the fact that the decomposition of hydrocarbon material and other important changes are likely to take place more rapidly in contact with the brick chequer work than in contact with coke, particularly when the coke has not been carbonized at a very high temperature. We considered therefore that the temperature of the regenerator should not be raised above 800°. Circulation gas at this temperature mixing with the hotter water gas appeared likely to give a mixture at a temperature convenient for carrying out the carbonization of the coal.

36.—Though numerous investigations have been carried out on the working of water-gas plants, our knowledge of the process does not yet enable us to predict with any great degree of certainty the conditions which make for the highest efficiency in general. Efficiency depends on the proper regulation of several factors, the more important of which are:

(*a*) The blast and steam velocities.
(*b*) The blow and run periods.
(*c*) The depth of fuel bed.
(*d*) The nature of the coke.

Recently, several excellent investigations of a technical character have shown that with any particular plant the output of water gas may be widely affected by altering any one of these factors. From the point of view of theory, efficiency depends materially on the extent to which the carbon dioxide, formed in the lower part of the fuel bed during the blow, is converted into carbon monoxide. We know that this reaction is materially influenced by the presence of ash in the fuel, and it is not outside the bounds of possibility that the presence of a small amount of tarry matter, which necessarily finds its way into the gasification zone of a plant such as we are considering, may have a certain influence in neutralizing the influence of the ash, thereby tending to minimize the reduction of the carbon dioxide in the blow gas, and to increase the efficiency of the blow process.

37.—Though it is obvious that the process taking place in the gasification zone of the complete gasification plant cannot follow exactly on the lines of the process taking place in a water-gas plant fed with cold coke, the simplest method of procedure was to assume that the blow and run followed the same course, and from the results of trial heat balances prepared on this basis to determine in which direction the water-gas process must be modified to meet the requirements of the new system. As a basis for our first calculations we made use of the results of the experiments recorded in Report VI. of the Institution of Gas Engineers, which were carried out under working conditions in Birmingham. The calculations based upon these experiments are referred to under the index C.VI. Later, the Fuel Research Board published the results of experiments carried out with their plant at Greenwich; and as the results of these experiments differ from the former, we based upon them a separate set of calculations, referred to under the indices F.R.3 and F.R.4.

38.—In the three sets of experiments referred to in par. 37, the yields of water gas and the ratios CO_2/CO were as below:

	Gas per Ton Dry Coke.	CO_2/CO.
C.VI.	51,280	12·17/12·77
F.R.3	58,680	19·06/ 2·84
F.R.4	60,900	14·55/ 9·29

The experiment F.R.3 relates to operation with a four-foot fuel bed. The results of the experiments C.VI. and F.R.4 appear to represent the limits between which the output of water gas may vary under practical working conditions in carefully operated plants. We have therefore taken these as the basis of our calculations.

39.—The composition of the dry coke used in these experiments was as follows:

	C.	H_2.	S.	N_2, O_2.	Ash.	Moisture.
C.VI.	83·27	0·90	1·93	1·73	13·13	8·0
F.R.4.	83·76	0·37	1·23	2·27	12·40	0·62

The disposal of the carbon per 100 parts by weight supplied to the generator was:

	C.VI.	F.R.4.
Carbon in water gas	41·60	45·37
Carbon in blow gas	50·35	49·22
Carbon lost and recovered	8·05	5·41

40.—As we are now considering the gasification of coke as a stage in the process of complete gasification of coal, we will take one ton of dry coal as the unit of material, and assume that it yields 0·65 ton of coke.

41.—An essential difference between the operation of the new process and of the ordinary water-gas process lies in the fact that in the new process the coke is supplied to the gasification system hot, while in ordinary water-gas practice the coke enters the generator at the air temperature. Since the heat interchange between the coke and the gas cannot be perfect, the gas must leave the system at a temperature higher than that at which the coke enters it. The rate at which heat exchange between a solid and a gas takes place depends not only upon the difference between their temperatures, but takes place the more rapidly the higher the temperature. The average temperature at which the gas leaves the top of the gasification zone in the new process should be much less in excess of the mean temperature of the fuel at that level in the gas producer than is the average temperature of the gas leaving a water-gas generator above that of the cold coke supplied to it intermittently. The sensible heat of the coke at temperature t° C. can be calculated in C.H.U. from the formula

$$1456 \times t\,(0{\cdot}195 + 0{\cdot}000115\,t),$$

where the quantity within the bracket is the mean interval specific heat of coke between 0° and t° C. The values which we shall require are as follows:

t° C.	Sensible Heat of Coke.
20°	5,700 C.H.U.
600°	231,500 ,,
800°	335,450 ,,
1000°	451,350 ,,

42.—If we now assume that the reaction proceeds as in the original experiments C.VI. and F.R.4, except for the fact that the coke is supplied to the system hot, we can draw up complete statements showing how the energy supplied to the system is disposed of and utilized; these statements showing whether the process can be operated on the lines laid down and how it must be modified to meet the new conditions.

43.—The total energy supplied and credited to the system is made up of:

(*a*) The sensible heat of the coke at t° C.
(*b*) The latent heat (net) of the coke.
(*c*) The sensible heat of the steam.
(*d*) The sensible heat of the blast.

The total energy debited to the system is made up of:

(*e*) The sensible heat of the water gas at temperatures t_2° and t_3°.
(*f*) The latent heat of the water gas.
(*g*) The sensible heat of the blow gas at temperature t_4°.
(*h*) The latent heat of the blow gas.
(*i*) The sensible and latent heat of ashes at temperature t_5°.

For simplicity in calculation, and to enable us to make use of tables which we have compiled, all quantities are reduced to pound-molecules (L M); the pound molecule of carbon being 12 lbs., that of hydrogen 2 lbs., &c. The datum temperature is

0° C., to which our data are corrected; and as water is not condensed in the process, thermal capacities of gases containing steam are stated as though condensation did not take place on cooling.

44.—We cannot consider the items in the table (par. 43) in the order in which they appear in the credit and debit summaries. The sensible heat of the coke has already been dealt with (par. 41). The latent heat of the coke (in net terms, as water is not condensed) can be calculated from data in the original paper. The value for 0·65 ton of coke are as follows:

C.VI.	9,907,550 C.H.U.
F.R.4.	10,021,750 ,,

45.—The sensible heat of the ashes can be calculated from the quantity removed, about 250 lbs. in C.VI. and 150 lbs. in F.R.4, the specific heat being 0·25, and the temperature taken as 400° C. The latent heat can be calculated from the quantity of carbon lost and recovered (par. 39).

	C.VI.	F.R.4.
Sensible heat of ashes (*i*)	25,000 C.H.U.	15,000 C.H.U.
Latent ,, ,, (*j*)	767,450 ,,	513,550 ,,
Total	792,750 C.H.U.	528,550 C.H.U.

46.—In order to obtain the remaining data we must consider the run and blow processes independently. In the run process the amount of carbon gasified can be calculated from the data in par. 39.

Carbon in Water Gas.

C.VI.	F.R.4.
$2240 \times 0{\cdot}65 \times 0{\cdot}4160 \times 0{\cdot}8237/12$ = 41·59 L M	$2240 \times 0{\cdot}65 \times 0{\cdot}4537 \times 0{\cdot}8376/12$ = 46·11 L M

47.—From these data and from the composition of the water gas per cent. (A), we can calculate the amount of each of the constituents (B) produced from 1 ton of coal in the gasification section of the plant.

	C.VI. A.	C.VI. B.	F.R.4. A.	F.R.4. B.
CO_2	4·25 p.ct.	3·79 L M	4·50 p.ct.	4·47 L M
CO	41·38 ,,	36·93 ,,	41·60 ,,	41·35 ,,
CH_4	0·75 ,,	0·67 ,,	0·25 ,,	0·25 ,,
C_2H_4	0·05 ,,	0·05 ,,	—	—
H_2	49·17 ,,	43·88 ,,	50·40 ,,	50·20 ,,
N_2,O_2	4·04 ,,	3·93 ,,	3·23 ,,	3·23 ,,

48.—The steam supplied to the generator per ton of dry coke can be obtained from the published paper.

	Per Ton Coke.	Per Ton Coal.
C.VI.	0·768 ton	1118·2 lb. .. 61·79 L M
F.R.4.	0·868 ton	1264·2 lb. .. 70·23 L M

Calculating the quantity of steam decomposed from the data in B (above) we have:

	C.VI.	F.R.4.
Steam decomposed	45·32	50·60
Steam in gas	16·47	19·63
Total steam	61·79	70·23

49.—The latent heat of the water gas is the sum of the products of the quantities of the combustible gases in par. 47 B and the respective values of the molecular heats of combustion (net), as below.

Carbon monoxide	67,935 C.H.U.
Methane	190,060 ,,
Ethylene	343,600 ,,
Hydrogen	57,830 ,,

Latent Heat of Water Gas (*f*).	C.VI.	F.R.4.
Combustion of CO	2,508,750 C.H.U.	2,809,050 C.H.U.
CH_4	127,300 ,,	47,500 ,,
C_2H_4	17,200 ,,	— ,,
H_2	2,537,600 ,,	2,897,300 ,,
	5,190,850 ,,	5,753,850 ,,

50.—The values of the sensible heat of the water gas at different temperatures can be calculated from the quantities of the constituent gases in 47 B, and the values of the mean interval molecular heats 0°—t° C. obtained by means of the equations of Holborn and Henning, which are given below:

CO, H_2, N_2, O_2	$S\ (0° - t°) = t\,(6{\cdot}5800 + 0{\cdot}000532\ t)$
CO_2	$S\ (0° - t°) = t\,(8{\cdot}8440 + 0{\cdot}003265\ t - 0{\cdot}00000079\ t^2)$
H_2O	$S\ (0° - t°) = t\,(8{\cdot}4042 - 0{\cdot}000302\ t + 0{\cdot}00000079\ t^2)$

As methane and ethylene are present only in very small quantities, no material error will be introduced in assigning to them the same values of specific heat as for carbon dioxide. The quantity of water vapour in the water gas is derived from par. 48. The total values of the sensible heat 0°—t_3° C. are given below:

	C.VI.	F.R.4.
0° to 400°	303,300 C.H.U.	339,500 C.H.U.
0° ,, 600°	463,250 ,,	519,600 ,,
0° ,, 800°	628,700 ,,	702,800 ,,
0° ,, 1000°	801,250 ,,	894,600 ,,

The down-run gas, about 1·5th of the whole, leaves the generator at about 400° (par. 43, t_3). The total sensible heat of the gas, when the up-run gas leaves the generator at t_3, is 1·5th of the value at 400° *plus* 4·5ths of the value at t_3. The totals are given below:

Final Temperature of Up-Run Gas t_3° C.	Sensible Heat of Water Gas (*e*) C.VI.	F.R.4.
400°	303,300 C.H.U.	339,500 C.H.U.
600°	431,250 ,,	483,600 ,,
800°	563,550 ,,	630,150 ,,
1000°	701,650 ,,	783,400 ,,

51.—The sensible heat of the steam has been calculated in the same manner, on the assumption that 1·5th of the total is superheated to 700° C. by passing through the regenerator.

Sensible heat of steam entering gas producer:

C.VI.	115,650 C.H.U.
F.R.4	131,450 ,,

52.—The thermal changes involved in the blow reactions can now be considered. The amount of carbon gasified as blow gas per ton of coal amounts to (par. 39)—

C.VI.	F.R.4.
$2240 \times 0{\cdot}65 \times 0{\cdot}5035 \times 0{\cdot}8237/12$ = 50·25 L M	$2240 \times 0{\cdot}65 \times 0{\cdot}4936 \times 0{\cdot}8376/12$ = 50·02 L M

53.—From these data, and from the composition of the blow gas per cent. (A), we can calculate the output of each constituent per ton of coal (B):

	A.	B.	A.	B.
CO_2	12·17 p.ct.	24·05 L M	14·55 p.ct.	29·58 L M
CO	12·77 ,,	25·03 ,,	9·29 ,,	18·88 ,,
CH_4	0·50 ,,	1·00 ,,	0·77 ,,	1·57 ,,
H_2	2·93 ,,	5·80 ,,	3·71 ,,	7·72 ,,
N_2,O_2	71·60 ,,	141·62 ,,	71·68 ,,	145·70 ,,

The latent heat of the blow gas is derived from the product of the quantities in columns B above relating to the combustible gases, and the values of the heats of combustion in par. 49:

	C.VI.	F.R.4.
Combustion of CO	2,371,850 C.H.U.	1,789,050 C.H.U.
,, ,, CH_4	190,050 ,,	298,400 ,,
,, ,, H_2	335,400 ,,	435,450 ,,
Latent heat of blow gas (*h*)	2,897,300 ,,	2,522,900 ,,

54.—The sensible heat of the blow gas (*g*) for our trial balance-sheets can be calculated from the data in column B above, and those in par 50.

Temperature of Gas.	C.VI.	F.R.4.
600° C.	872,950 C.H.U.	909,700 C.H.U.
800 ,,	1,187,450 ,,	1,238,650 ,,
1000 ,,	1,511,950 ,,	1,577,900 ,,

55.—The quantity of air consumed during the blow, calculated from the data in column B, is

C.VI.	$(24{\cdot}05 + 25{\cdot}30/2) \times 100/21 = 174{\cdot}8$ L M
F.R.4	$(29{\cdot}58 + 18{\cdot}88/2) \times 100/21 = 183{\cdot}3$,,

The sensible heat of the air at 20° C. (*d*) is

C.VI.	21,300 C.H.U.
F.R.4	22,300 ,,

56.—We have now the data for the compilation of the statements of credits and debits which are given below.

—			C.VI.				F.R.4.			
Temperature of Coke	Par.		20°.	600°.	800°.	1000°.	20°.	600°.	800°.	1000°.
Sensible heat of coke	41	*a*	5,700	231,500	335,450	451,350	5,700	231,500	335,450	451,350
Latent heat of coke	44	*b*	9,907,550	9,907,550	9,907,550	9,907,550	10,021,750	10,021,750	10,021,750	10,021,750
Sensible heat of steam	51	*c*	115,650	115,650	115,650	115,650	131,450	131,450	131,450	131,450
Sensible heat of air	55	*d*	21,300	21,300	21,300	21,300	22,300	22,300	22,300	22,300
Total credits			10,050,200	10,276,000	10,379,950	10,495,850	10,181,700	10,407,000	10,510,950	10,626,850

Temperature of Gas	Par.		400°.	600°.	800°.	1000°.	400°.	600°.	800°.	1000°.
Sensible heat of water gas	50	*e*	303,300	413,250	561,550	701,650	339,500	483,500	630,150	783,600
Latent heat of water gas	49	*f*	5,190,850	5,190,850	5,190,850	5,190,850	5,753,850	5,753,850	5,753,850	5,753,850
Sensible heat of blow gas	54	*g*	569,550	872,950	1,187,450	1,511,950	593,000	909,700	1,238,650	1,577,900
Latent heat of blow gas	53	*h*	2,897,300	2,897,300	2,897,300	2,897,300	2,522,900	2,522,900	2,522,900	2,522,900
Sensible and latent heat of ashes	45	*i j*	792,450	792,450	792,450	792,450	528,550	528,550	528,550	528,550
Total debits			9,753,450	10,184,800	10,629,600	11,094,200	9,737,750	10,198,500	10,674,100	11,166,800

57.—In the foreegoing table the temperatures at the heads of the upper columns are those at which coke is supplied to the gasification system. The temperatures at the heads of the lower columns are the average temperatures of the gas leaving the top of the coke during the whole period of operation. To maintain a balance in the system under any particular set of working conditions, the amounts of energy credited and debited to it must be equal. If we consider the condition when coke is supplied to the system at air temperature (20°), referring to the accompanying curves we see that the balance will be reached when the gas leaves the system at about 500° in C.VI. and at about 600° in F.R.4. Reference to the original papers indicate that the gas was at a higher temperature in the second experiments than in the first, and the conclusion arrived at above is of the same order as the results recorded.

58.—It is obvious that the temperature at which the gas leaves the system must be higher than that at which the coke enters it. Reference to the figures in the horizontal lines *a*, *e*, and *g* in the table show that, for equal increases of temperature, the increase in the sensible heat of the gases is greater than the increase in the sensible heat of the coke. This is indicated also by the approaching of the curves representing the debits and credits as the temperature rises; and where the curves intersect, a balance could only be maintained if perfect heat interchange were established between the coke and the gas.

59.—With a rise of temperature the efficiency of the process of heat interchange between the coke and the gas undoubtedly increases, and at temperatures in the neighbourhood of 800° it is likely that the temperature of the gas would be less than 200° higher than that of the coke. If this were the case, the totals in the upper columns under the heading 800° should be greater than the totals in the lower columns under the same temperature heading, and should approach the values of the totals in the lower columns under the heading 1000°.

60.—To effect this result, the process as operated when the generator is fed with cold coke must be modified. Preheating the whole of the steam to 700° would go a certain way to adjust the balance, by introducing an additional 250,000 to 300,000 C.H.U. on the credit side. The most obvious way in which to adjust the balance is to arrange and operate the plant so that the carbon dioxide content of the blow gas is increased, and for the gasification of the same quantity of carbon in the blow process, the latent heat of the blow gas is reduced, and the amount of heat energy set free in the fuel bed increased. If in the operation of a plant on the lines of the experiments F.R.4 the ratio CO_2/CO in the blow gas were changed from 14·55/9·29 to 19/5, the other condition remaining identical, we could obtain a balance with the coke entering the gasification zone at 800° and the gas leaving it at 1000°.

61.—This does not involve the implication that there is any greater difficulty in operating the gasification process in the complete gasification plant than in the simpler water-gas plant. As was stated in par. 36, efficiency in any plant operating on the water-gas principle is dependent upon the proper control of the air and steam velocities, and of the blow and run periods. As our practical results show, we have experienced no difficulty in obtaining satisfactory results.

62.—It is somewhat difficult to arrive at an exact estimate of the volume and quality of the gas produced on the basis of theory and of experience of water-gas plant and of coal carbonization plants only. It may be anticipated that, even if the maximum temperature obtained in the carbonization section of the plant does not exceed 800° C., under the direct action of the stream of hot gas carbonization would be effected much more efficiently than in the case in which the coal was treated at the same temperature in a retort, even if steam was admitted to the bottom of it. In any case the whole of the volatile material of high calorific value would be driven out of the coal and conserved. The gas remaining in the coke entering the gasification zone would, in part, go to increase the volume of hydrogen in the water gas, and, in part, be carried away by the blow gas.

63.—It does not appear to have been noticed that in steaming vertical retorts the excess gas always contains more hydrogen than corresponds to the oxides of carbon in it—to the extent of 1000 to 1500 c.ft. of hydrogen per ton of coal, independently of the quantity of steam used. This hydrogen is undoubtedly produced by the action of steam on iron, ferrous oxides, and sulphides, which are left in the coke from the carbonization process, but would be oxidized if the coke was quenched and exposed to the air. This hydrogen would undoubtedly be an addition to the hydrogen produced by the action of steam on carbon in our process. Without here going into details, we have estimated that the output from our process would be between 46,500 and 53,000 c.ft. of gas at a calorific value between 370 and 360 B.Th.U., and the composition should be as follows:

CO_2	5 to 6 p.ct.
C_mH_n	·7 ,, 1 ,,
CO	28 ,, 30 ,,
CH_4	8 ,, 10 ,,
H_2	50 p.ct.
N_2	6 to 7 p.ct.

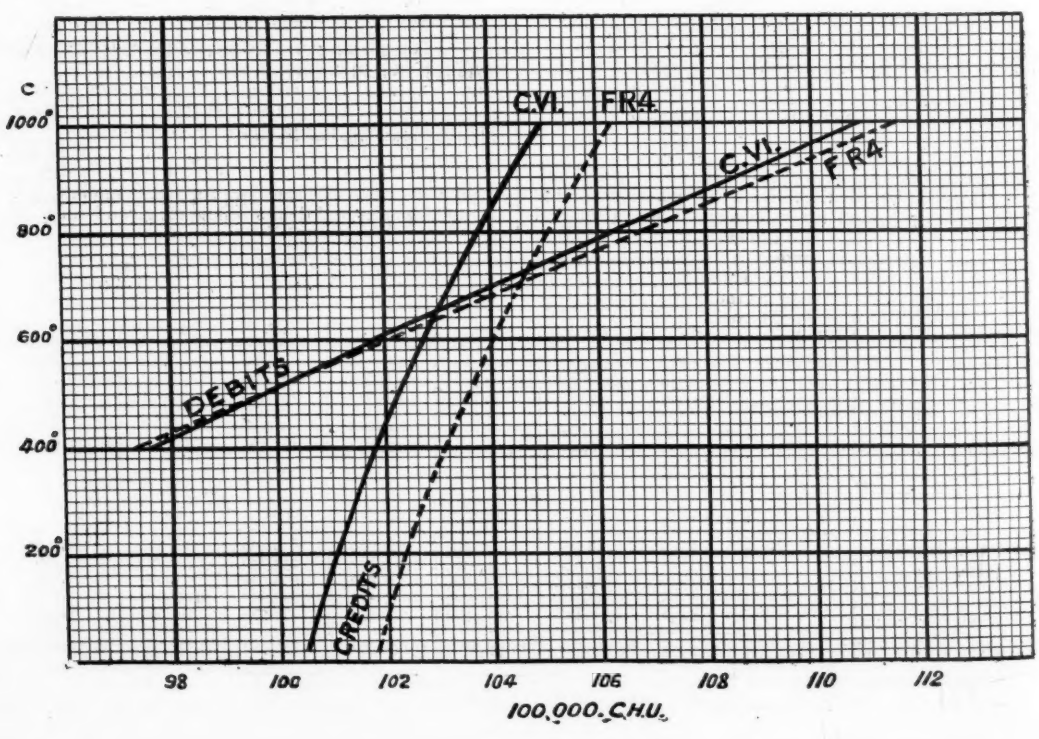
We will now consider the carbonization of the coal.

64.—Of the total quantity of water gas produced in the plant, only the up-run gas passes directly through the coal. If we suppose that this amounts to 4-5ths of the total gas produced, and assume that the gas leaves the gasification zone at an average temperature of 900°, leaving the top of the carbonization chamber at an average temperature of 400°, we can estimate the amount of heat which it gives up to the coal from the figures in par. 50. We have then:

	C.VI.	F.R.4.
Sensible heat of gas 900°	715,000 C.H.U.	798,000 C.H.U.
,, ,, ,, 400°	303,500 ,,	339,500 ,,
Difference	411,500 ,,	458,500 ,,
Difference 4-5ths	329,000 ,,	367,000 ,,

The quantity of sensible heat in the water gas, which is available for the process we are now about to consider, lies, therefore, in the neighbourhood of 350,000 C.H.U.

65.—The carbonization of the coal is carried out in such a manner that the fuel is distilled and the coke reaches the gasification chamber at or above a temperature of 800° C., the gas leaving the system at 400° C. Two estimates of the amount of heat required to carbonize coal have recently been published, both relating to carbonization in vertical retorts. One is to be found in Report IV. of the Institution of Gas Engineers, and the other in the Report of the Fuel Research Board for 1920-21. From the results of Prof. Cobb's experiments, the amount of heat required to carbonize coal containing 10 p.ct. of moisture per ton of dry



coal was 1,365,000 B.Th.U., or 758,300 C.H.U.; the coke and the gases leaving the retort at about 400°. We have in the present case to consider the removal of the coke from the carbonization zone at 800° C. We have, therefore—

To carbonize coal, products at 400° . .	758,300 C.H.U.
Sensible heat of coke 400° (par. 41) . .	−141,100 ,,
,, ,, ,, 800°	335,450 ,,
To carbonize coal, coke at 800° . . .	979,650 C.H.U.

In two experiments carried out by the Fuel Research Board the quantities of heat required to carbonize coal containing about 1 p.ct. of moisture, per ton of dry coal, were 901,000 and 962,000 B.Th.U. respectively, the mean value being equal to 518,700 C.H.U. We have, therefore:

To carbonize coal, products at 400° . .	518,700 C.H.U.
Sensible heat of coke 400°	−141,100 ,,
,, ,, ,, 800°	335,450 ,,
To carbonize coal, coke at 800° . . .	743,050 C.H.U.

The difference between the two results can be accounted for by the fact that to evaporate a quantity of water equal to the difference in the moisture contents of the two coals, would require about 150,000 C.H.U.

66.—This brings us to the conclusion that to carbonize a ton of coal in the complete gasification process, using a coal containing about 5 p.ct. of moisture, would call for an expenditure of about 850,000 C.H.U. or *between two and three times the amount of energy available from the water-gas generated in the plant.*

67.—In the case of a plant with a nominal rating of 350,000 c.ft. in 24 hours, the output of gas per run of six minutes would be about 2100 c.ft., and it would be necessary to circulate not more than twice the volume of the up-run gas, or about 3200 c.ft. of gas, or not more than 900 c.ft. per minute. This was the estimate upon which we based the capacity of the circulator; and in actual practice the quantity of gas circulated was of the order of 600 to 700 c.ft. per minute.

68.—In conclusion we may discuss the regenerative process briefly. The sensible heat of the blow gas is approximately 1,400,000 C.H.U. at 900°; and if this leaves the regenerator at 400°, the heat retained and available for heating the circulation gas is approximately 800,000 C.H.U. If a small proportion of the blow gas is burned, utilizing only 500,000 C.H.U., and the waste gas leaves the regenerator at the same temperature, the heat available for heating the blow gas will be approximately 1,200,000 C.H.U., allowing for the sensible heat of the added nitrogen. This is approximately equal to twice the value of the sensible heat of the water gas 0°—800°, so that on this basis sufficient heat could be supplied to the system for the carbonization of the coal. Since the circulation gas enters the regenerator at or near the air temperature, if the regenerator is large enough, this part of the process can be made very efficient. The utilization of the waste heat in the gas leaving the top of the generator is a problem which we have under consideration.

69.—The only point to which attention must be called in connection with the regenerative process is the following. The gas, as it leaves the plant, is laden with water vapour, tar fog, and the vapour of light hydrocarbons. At first sight it would appear to be advantageous to pass this gas direct to the regenerator, so as to conserve the sensible heat and convert the light hydrocarbon material into permanent gas. There are, however, two objections to this procedure. In the first place, the cracking of aromatic hydrocarbons is likely to result in the production of naphthalene derivatives. Secondly, it would be impossible to crack the hydrocarbons without passing the steam into the regenerator. Steam in the circulation system is undoubtedly objectionable; for if the concentration of the water vapour rose above a certain limiting value, in contact with the hot brickwork in the regenerator, the water-gas reaction would be reversed, some of the carbon monoxide in the gas being converted into carbon dioxide, with simultaneous formation of hydrogen. We therefore found it necessary to take the circulation gas into the plant from a point between the condenser and the relief holder. As theory would indicate, there was no tendency for the carbon dioxide in the gas to increase so long as the temperature of the circulation gas was kept below 90° Fahr., or 33° C.

70.—In the introduction to this paper it was stated that the practical results obtained were in close agreement with those predicted on the basis of theory; and those who have followed the foregoing reasoning and calculations will have checked that statement. They will also have obtained a clear idea of the new principle introduced into the process for the production of town gas, which has been described as the *Regenerative Coal Gasification System* for the complete gasification of bituminous coal. On a future occasion it is hoped to publish a detailed account of the operation of the same plant when producing a gas enriched up to a declared value. We shall also deal with the running cost (which is very small) and with other details—such as the output of tar and ammonia. The experience of some months' working shows already that the cost of upkeep is likely to be small, as might be anticipated from the fact that really high temperatures are maintained only within the body of the fuel, and not in such enclosed spaces which must exist in every retort-setting.

INSTITUTION OF GAS ENGINEERS.

Council Meeting.

A Meeting of the Council was held at the Council House, Birmingham, on Monday, Oct. 1—the PRESIDENT (Mr. Samuel Tagg) in the chair.

It was reported that Mr. Thomas F. Canning, of Southend-on-Sea, had been appointed District Member of Council, representing the Eastern Counties Association, for the year 1923-24, and Mr. J. M. Smith, of Stirling, to represent the North British Association.

The report of the City and Guilds of London Examiner in Gas Supply was communicated, and it was decided that it should be published.

Letters acknowledging their election as honorary members of the Institution were received from the respective Presidents of the Société Technique de l'Industrie du Gaz en France and the American Gas Association.

To fill the vacancy as Member of Council caused by the election of Mr. J. Ferguson Bell, of Derby, as Vice-President, Mr. W. E. Caton, of Oxford, was appointed.

The following candidates were approved for the class of member: Messrs. Alfred W. Grey, of Rochester; Alexander Dow, of Galashiels; and Walter M. Paterson, of Bath. For associate member: Messrs. Reginald Bowden, of Lincoln; and Reginald C. Taylor, of Bridlington.

Messrs. William R. Branson, of West Hartlepool; Harold G. Broadbridge, of Leamington; Edward C. Le Jeune, of London; Joe B. Preston, of Spenborough; Charles D. Terry, of Leamington; Charles C. Wood, of Wellingborough; and Stewart L. Wright, of Birkenhead, were admitted as students.

The deaths of Mr. Joseph Davis, of Gravesend, Mr. John Niven, of Allerton, and Mr. James Robb, of Chepstow, were reported; and a vote of sympathy with their relatives was passed.

Arrangements for the Institution's session at the Public Works, Roads, and Transport Congress on Thursday, Nov. 22, at the Agricultural Hall, London, were approved. The following papers are to be read and discussed: "The Quality and Composition of Town Gas," by Mr. H. E. Bloor, of York. "The Position of Mains in Public Highways," by Mr. Stephen Lacey, of London.

The report of the Institution's delegate at the Congress of the Royal Sanitary Institute at Hull was received.

The recommendations of a conference of a Joint Committee of the Institution and the Society of British Gas Industries with reference to a standard taper of plugs for gas-taps for stoves and fittings were approved. They are to be forwarded to the National Gas Council.

The appointment of the Advisory Committee and of the Board of Examiners under the Education Scheme was confirmed. A report was read from Mr. Walter Hole on the progress of arrangements for bringing the scheme into operation, and indicating the keen interest which is being taken in the matter in all parts of the country. Modifications necessary to adapt the scheme to Scottish conditions are now under consideration.

Preliminary arrangements for the Institution's meeting in London next year were discussed. It was decided to resume the awarding of medals for papers presented.

The subscriptions received for the Smithells Testimonial Fund from members of all grades were reported; and it was stated that contributions were still coming in, and that further amounts were anticipated.

Recommendations of the Gas Investigation Committee with respect to the expenditure on the researches now being carried out were adopted. Progress of the work of the Sub-Committee having in hand the proposed standard tests of gas-cookers was reported.

The Institution's nomination of a recipient of the Kelvin Gold Medal was referred to a Committee of the Council.

Reports of the Emergency Committee and of the Finance Committee were presented, accepted, and adopted.

Institution of Engineers-in-Charge.—At the meeting to-day, the President-Elect (Mr. T. Cooper, M.A., M.Inst.C.E.) delivers his address. The subject is "Engineering Records, and their Value to the Engineer-in-Charge." The chair will be occupied by the retiring President (Dr. Hele Shaw).

Old Rubber for Making Belt Dressing.—A wrinkle in the "Gas Age-Record" states that old rubber, worn-out inner tubes, and the like may, used in a composition, be employed as a belt dressing and pulley cover. The rubber is first cut up into small pieces, and then heated in an ordinary kettle to the desired temperature. The heating reduces the rubber to a liquid condition. Old rubber which has been subjected to more or less oxidation due to exposure to air, is used preferably, as it produces a superior product. Old rubber which contains such substances as zinc oxide, sulphate of barium, lampblack, &c., gives good results. A thick liquid substance is produced by the fusing process, which is no longer rubber. It is of very heavy consistency, highly adhesive, of a waterproofing nature, and capable of attaching itself strongly to surfaces, and of forming a frictional coating on them.

WORK OF THE FUEL RESEARCH BOARD.

The report for the financial year ended July 31, 1923, of the Committee of the Privy Council for Scientific and Industrial Research, which will be noticed next week, contains the usual summary of the work of the Research Boards and Committees of the Department. In addition to extended reference to the subject of "Power Alcohol," the following account is given of the work of the Fuel Research Board.

During the year, new experimental vertical retorts, based on Scottish shale oil practice, have been erected with a view to low-temperature carbonization on a commercial scale. It is proposed to briquette a blend of coking and non-coking coals by raising them to a temperature below the decomposition point, and then subjecting them to pressure without any added binder. The briquettes will then be carbonized in the new retorts. A considerable amount of preliminary work was necessary before the details of the retort and briquetting press could be decided on; and the plant has not yet been running sufficiently long for any conclusion to be reached.

A report on some preliminary experiments in low-temperature carbonization in vertical retorts has been published in Technical Paper No. 7.* The Fuel Research Board have continued to maintain close touch with experiments carried on by outside workers, and with developments generally, in this country and elsewhere. Owing to the temporary shutting-down of the vertical retorts, it was not possible, for a considerable portion of the year, to undertake large-scale work in connection with the carbonization of coal; and the opportunity was taken to carry out some comprehensive tests on the efficiency of water-gas plant working under various conditions. The results have been published in Technical Paper No. 6.†

In addition, the Board have carried out a variety of smaller-scale work, including tests on the combustion of coke, tests of CO_2 recorders, tests on the Thomas recording calorimeter, and on the use of tetralin and tetralin-petrol mixtures for motor-car engines. Experiments are also being made with a view to developing a producer-gas plant for use in the Colonies, where charcoal is available, but where water is scarce, and petrol, or similar fuels, expensive. An investigation has been carried out at the request of the Development Commission into the carbonization of seaweed, with a view to examining the possibility in the present circumstances of reviving the seaweed industry on the Atlantic coast. A report on this is being prepared for publication.

The first section of the report of the Fuel Research Board for the years 1922, 1923 has been published, and deals with the work done in connection with the production of air-dried peat.‡ This includes a report by Prof. Pierce F. Purcell, M.A.I., M.Inst.C.E., Peat Investigator to the Board, on the present position in the winning of peat in Ireland, Canada, Sweden, and Germany. Prof. Purcell has dealt with the problems involved in the working of peat bogs on a large scale, and has visualized possible schemes for peat-winning on a scale of 100,000 tons per annum from one bog area over a period of years. He has shown very clearly, and for the first time, the vital importance of the initial lay-out of the bog for a definite scheme of development year by year over a sufficiently long period. Only in this way can trustworthy estimates be made of the amount of peat which can economically be won from a given bog, and the approximate cost of winning it.

The Board have also published during the year a description of an apparatus for the measurement of the specific gravity of gases in small quantities.§ This apparatus was designed at H.M. Fuel Research Station. It works with an accuracy of about 0·5 p.ct. for gases with a specific gravity between 0·4 and 0·6 (air = 1). About 1½ litres of gas are required for a complete determination in duplicate.

PHYSICAL AND CHEMICAL SURVEY OF THE NATIONAL COAL RESOURCES.

The Committee for the Survey of the Lancashire and Cheshire area, the establishment of which was reported last year, have been at work throughout the year; and valuable data and experience have been gained. It has been possible to prepare a preliminary correlation of data for this area; but much more information must be collected before this can be either as complete, or as reliable, as that published for the Yorkshire, Nottinghamshire, and Derby area. Two of the most important of the seams in the Lancashire and Cheshire area have been dealt with in a fairly exhaustive manner; and the question of the publication of the results is now under the consideration of the Local Committee. The work carried out at H.M. Fuel Research Station, both in large-scale work in the retorts and by tests of special samples of a few hundredweights, has given valuable information as regards these seams. This work forms an important part of the examination of the seams, and supplements the purely laboratory examination of samples.

A new Committee have been established in the South Yorkshire area, with the co-operation of the South Yorkshire Coal Trade Association and the Midland Institute of Mining, Civil, and Mechanical Engineers. Arrangements have been made for the Lomax Palæobotanical Laboratories to continue the microscopical examination of coal seams in connection with the survey.

SAMPLING AND ANALYSIS OF COAL.

The Committee on the Sampling and Analysis of Coal have presented an interim report on methods of analysis of coal, recommending those they consider best. The report is based on a large amount of experimental work carried out by the Committee during the past eighteen months, and is now in the press. The recommendations will be adopted by the Fuel Research Board for their work in connection with the survey; and it is hoped that all workers interested in the sampling and analysis of coal will do likewise, and thus render analyses by different investigators more comparable than has hitherto been the case. The Committee have still to deal with the difficult question of sampling. It is proposed that this Committee should continue as a Standing Committee of the Board, and should from time to time review the methods of sampling and analysis in the light of further knowledge as it becomes available.

GAS MAKING IN VERTICAL RETORTS.

Early in the year under review certain defects developed in the retorts; and it was considered preferable from the experimental point of view to renew the lining rather than to repair it. The reconstruction was completed in January last, since when tests have been made, at the suggestion of an important gas undertaking, on another type of Durham coal. The coal necessary was provided free of charge by the undertaking in question. Tests on a South Wales gas coal are approaching completion. The results of the tests on a Wigan Arley coal (Lancashire and Cheshire area) will shortly be published as Technical Paper No. 8. As before, they show a considerable gain in the more highly-priced products resulting from the introduction of steam into the retorts during the process of carbonization.

Advantage was taken of the reconstruction of the retorts to remove the cast-iron linings and shutters of the sight-holes and replace them with fireclay plugs. The result of this has been a striking reduction in the consumption of gas for heating the retorts. The saving amounted to about three therms per hour for the setting of four retorts, or some seven therms per ton of coal carbonized. This typifies some of the savings which might be effected in practice if greater attention were paid to the reduction of heat losses by radiation, &c.

DOMESTIC HEATING.

During the year, Dr. Margaret Fishenden has been working directly under the Board, using accommodation at the Westminster Technical Institute kindly placed at her disposal by the London County Council. A room has been suitably equipped as a laboratory for experimental work; and Dr. Fishenden is engaged in carrying out investigations of the physical and chemical factors which determine comfort conditions. Special attention is being paid to the conditions produced by artificial heating; and it is hoped to make comparisons of different types of domestic heating apparatus in such a way as to determine the relative amounts of energy which must be expended by each in order to produce approximately equivalent conditions of warmth comfort in a room. The results will be considered in relation to the size, construction, position, and orientation of the room, and the weather conditions; and the possible influence of psychological and physiological factors is not being lost sight of. The problem is complex; but if the effects of the various factors can be disentangled, considerable light should be thrown upon the question of the most economical methods of heating in different cases. Dr. Fishenden is also giving assistance to H.M. Office of Works in investigating the products of combustion emitted from flueless gas-heaters, in view of their possible deleterious effects upon health.

A further grant has been made to the Manchester Corporation Air Pollution Advisory Board for the purposes of Mr. F. S. Sinnatt's work at the Manchester College of Technology on the composition of the waste gases, and the amount and approximate composition of the soot emitted from coal fires, and the magnitude of the losses involved thereby. Preliminary work has indicated that the heat loss due to the incomplete combustion of the gases produced during the burning of coal in domestic grates is more serious than has generally been supposed, and may, in extreme cases, represent as much as 25 or 30 p.ct. of the theoretical heat of combustion of the coal. A better chemical efficiency of combustion was shown by coke than by coal. Work is progressing.

* See "JOURNAL," Vol. CLXIII., p. 581.
† See "JOURNAL," Vol. CLXII., p. 662.
‡ See "JOURNAL," Vol. CLXIII., p. 479.
§ See "JOURNAL," Vol. CLX., p. 797.

The Big Brother of the Gas Industry.—This is the title of a book published by the American Gas Association, for a copy of which we are indebted to Mr. Oscar H. Fogg, the Secretary-Manager of the Association. It describes in an interesting manner the work and accomplishments of this vast organization, which—like the British Commercial Gas Association—fills an imperative need. The membership includes 480 gas companies, representing 90 p.ct. of the manufactured-gas business of the United States. There are also no fewer than 270 manufacturing companies (making gas appliances, apparatus, and accessories) who subscribe to the funds of the Association. With such an extensive and representative membership it has become a general clearing house of information, with a permanent headquarters' staff and numerous committees of experienced men who are giving much of their time and energies to a solution of the innumerable financial, technical, legal, publicity, and commercial problems which naturally arise.

PRINCIPLES OF HEATING.

Several important points in connection with the principles of heating were discussed by Mr. KENNETH GRAY, M.R.San.I. (Past-President of the Institution of Heating and Ventilating Engineers), of Messrs. James Gray, Ltd., in a lecture delivered by him at Olympia during the Shipping Engineering and Machinery Exhibition.

In the first place, he pointed out that frequently when installing a system in this country heating engineers are called upon to provide for an internal temperature of 60° Fahr. when it is 32° Fahr. outside. This would appear to be a perfectly concise and definite instruction; nevertheless it leaves out a factor of predominating importance, inasmuch as it omits any reference to wind velocity. The internal temperature of every building is almost as dependent upon the velocity of the wind as upon the external air temperature. It is obvious that the internal temperature will depend not only upon the number of heat units given out within the building, but also upon the number of heat units carried away from it; and the number of heat units carried away is greatly dependent upon the velocity of the wind. This matter, he suggested, should prove a fruitful source of inquiry for those who are entrusted with research work in connection with the heating question.

Another factor which in Mr. Gray's opinion does not receive the attention to which it is entitled, is that of humidity. The amount of moisture air can hold increases with the temperature; and air which is completely saturated at 40° Fahr. becomes only 50 p.ct. saturated when its temperature is raised to 60° Fahr.—assuming, of course, that there has been no water for it to absorb in the process of warming. Air which is only 50 p.ct. saturated is drier than is good for one. Thus, in warming our homes in cold weather, we tend to surround ourselves with very dry air—creating an atmosphere unlike the outside atmosphere, which is obviously the one in which we are intended to live. The air seeks to modify this condition by absorbing moisture with avidity. Failing to obtain moisture elsewhere, it gets it from our bodies. When water is evaporated, heat is used up in the process; and the consequence is that there is a loss of heat from our bodies, which produces an effect of chilliness which is felt irrespective of the actual temperature of the air. Moistening of the air is thus even more necessary in winter than in summer; for we have then to some extent interfered with the natural laws. There is, the author pointed out, little variation in the degree of humidity of external air throughout the year in any particular place. In heating systems the important factor of humidity should not be ignored.

Turning to another aspect of this complex question, Mr. Gray referred to the fact that those whose occupation keeps them out of doors are as a class healthier than those who are kept within. This being so, when we try to provide suitable internal conditions, we should look further than providing a certain temperature. As far as possible we should try to reproduce that section of the outside conditions which increases our feeling of warmth and comfort. When we begin to look at the matter from this point of view, one of the first things which becomes evident is that our personal feeling of warmth has very little to do with the air temperature. With plenty of radiant heat, we can exist comfortably in air of almost any temperature, if only the air is moving. Keeping in mind that any method of heating which approaches most nearly to the conditions of warm sunshine and cool moving air (as opposed to a heated atmosphere within four walls) is the best from the standpoint of health, the old-fashioned open fire still seems to produce the nearest imitation. All the essential conditions are there; and yet the method has its well-known objections. The heat that is wasted in an open fire is something between 80 and 90 p.ct. of the total contained in the fuel. Then there is the smoke caused, and the draught which sweeps along the floor surface towards the fireplace, which is regarded as another drawback, though the combination of cool, moving air, and radiant heat is the condition necessary to provide healthy heating. Wherein, then, lies the objection to the air movement in the case of open fireplaces? It is, Mr. Gray thinks, that the air in rooms which are heated by open fires is of different temperatures. What is called a draught is in reality a stream of air, colder than the air through which it is passing.

The principles embodied in the electric radiator seem to conform closely to the natural laws; but unfortunately the cost of current is so high. It can only be applied on a limited scale, and is far too costly for the purpose of warming a building. All the means of heating at disposal, in which separate units are required, have their good and their bad points; but the question of running cost is always very much against them.

If we want economical heating on a large scale, we are almost forced to adopt central heating of some kind; for in this case the fuel is burned in enclosed furnaces, and the combustion is reasonably complete. But these systems have their disadvantages. The distribution of heat by warmed air, as in a hot-air system, falls very far short of the ideal. Radiators heated by water or by steam also tend, by heating the air, to produce too dry an atmosphere; but they do gradually warm-up the fabric of which the building is constructed, and with warmed walls it is possible to take advantage of the one factor in which there appears a prospect of obtaining atmospheric conditions within a building approximating very closely to those outside—by simply keeping the windows open.

It is up to heating engineers to do all they can to convince the public that there is great scope for improving the health of the nation by keeping windows open. Mr. Gray thinks that the open fires which were for generations the only means of domestic heating are indirectly responsible for the fact that windows are so ruthlessly kept shut in winter.

Voluntary Thermal Standard for Colorado.

A move which is new in the American gas industry has been made by the Public Service Commission of the State of Colorado, on the recommendation of Mr. H. B. Dwight, their Engineer. He pointed out that an arbitrary standard of heating value might easily result in hampering gas utility operations without in itself improving in any respect the quality of the service rendered; also that marked improvements in gas-production methods and apparatus are being made, and that a lowering of B.Th.U. standards is an essential part of the present trend of these improvements, and is not necessarily detrimental to the consumer's service. In addition, he emphasized the undoubted fact that any steps regulatory bodies may take which will encourage the gas utilities in regaining that prosperity which for several years they have lacked, will result in improved service and satisfaction to the gas-buying public. The order that the Commission made, which came into operation on the 1st inst., applies to all gas undertakings within the State of Colorado. It sets forth that each utility undertaking supplying gas for domestic or commercial purposes shall establish and maintain a standard heating value for its product, which standard shall be the monthly average total heating value of the gas as delivered to customers at any point within one mile of the manufacturing plant or centre of distribution. This standard heating value shall be that value which, from its experience, the undertaking finds it most practical, economical, and efficient to manufacture and to supply to its customers to their satisfaction. The utility undertaking shall be prepared to justify the standard it adopts before the Commission, by such pertinent facts as may be required.

Gas for Marking Roofing Material.

The patentees and producers of a new form of asphalt slate-surfaced strip shingle were confronted with the problem of embossing a design on a sheet of asphalt-coated felt that was covered with crushed slate firmly embedded in the asphalt coating. The contemplated method of manufacture of this improved form of shingle (so far as the problem to be considered was concerned) was to take rolls of roofing from 100 ft. to 200 ft. long, and 3 ft. wide, put them on spindles, and draw them through a device that would emboss four straight black lines at regular distances across the sheet, over its full length. The black lines forming the design of this shingle had to have several qualities. The design had to be permanent; it must not detract from the weather-proofing qualities of the shingle, and it must not be smeary. Also it had to go on the sheet at identical intervals at all times, so that it would align with the cutting operations. Practical experience told the manufacturers that indelible black lines could be obtained if the jet-black asphalt coating already on the sheet of the roofing could be utilized. But this heavy coating of asphalt was cold and completely covered with a heavy surfacing of ground slate. Consultations between Mr. D. R. Ryder (of the Public Service Company, Newark, N.J.), he writes in the "American Gas Association Monthly," and the manufacturing interests resulted in a decision to have installed a device that would play four lines of gas-flames upon the portions to be designed. These lines of flame were to be 4 ft. long, so that sufficient heat would be applied to the sheet to offset the speed at which the sheet passed through the machine—100 ft. a minute. It was calculated that this would reduce the asphalt to the consistency of a heavy liquid. Immediately following the heating of the asphalt coating, four drag shoes, with contact runners $\frac{3}{8}$ in. wide, were to pass over the sheet. If this resulted in the ground slate surfacing being pushed down into the heavy coating, and the coating being brought to the surface at the points desired, indelible lines would be produced in a continuous operation, along with the cutting, &c., and without introducing any foreign agencies. Such a machine was installed, and over a period of four months has been an unvarying success.

Southern Association of Gas Engineers and Managers (Eastern District).—The next meeting of the Eastern District of the Association will take place at 2.30, on Thursday, Oct. 18, at the Institution of Gas Engineers, No. 28, Grosvenor Gardens, S.W.

Scottish Junior Gas Association (Western District).—Along with a copy of the Joint Transactions of the Scottish Junior Gas Associations (Eastern and Western Districts), for the Nineteenth Session, is a notice of the opening meeting for the new session of the Western District. This will take place in the Royal Technical College, Glasgow, next Saturday (the 13th inst.), at 7 o'clock, when Mr. Andrew Walker, of Kilbarchan, will deliver his Presidential Address. Arrangements have been made to visit the Housing and Health Exhibition, at Kelvin Hall, during the afternoon. On Saturday, Oct. 27, there is to be a visit to the Edinburgh meter works of Messrs. R. Laidlaw and Sons.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

"A Matter of 'Seconds.'"

SIR,—The Committee of the Incandescent Mantle Manufacturers' Association have given consideration to the article in your issue of Sept. 12 under the above heading.

My Association fully appreciate the importance of maintaining a high quality in gas-mantles; and to secure this object would be glad to meet the representatives of the gas industry who are equally interested in the matter.

C. J. HEALY, Secretary,
The Incandescent Mantle Manufacturers' Association.

11 & 12, *Pall Mall, London, S.W.* 1,
Oct. 2, 1923.

Mechanical Grate Water-Gas Producers.

SIR,—On p. 937 of the "JOURNAL" for Sept. 26, is an article "Mechanical Grate Water-Gas Producers," in which you mention that hand clinkering is eliminated.

May we point out that the "Sydenham" grate has been fitted in the "Simplex" water-gas plants for over two years, and that clinkering is entirely done away with. The grate is as efficient under this severe test as in the ordinary furnaces of retort-settings; and we believe the "Simplex" to be the first water-gas plant without clinker troubles.

Regarding the "Simplex" water-gas plant, the coke consumption over six months' ordinary working is 34·9 lbs. per 1000 c.ft. The composition of the blue gas is as follows:

CO_2	2·95
CO	43·5
H_2	45·0
CH_4	3·75
N_2	4·5

Calorific value (gross), 323 B.Th.U.

THE VERTICAL GAS RETORT SYNDICATE, LTD.
ED. LINSLEY.

17, *Victoria Street, Westminster, S.W.* 1, *Oct.* 4, 1923.

REGISTER OF PATENTS.

Distillation of Carbonaceous Materials.—No. 202,738.

NIELSEN, H., of Muswell Hill, N. 10, and LAING, B., of Hatfield.

No. 14,784; May 25, 1922.

This invention relates to the distillation or heat treatment of carbonaceous and other materials in stationary or revolving tubes or retorts, horizontal or inclined, and heated externally or internally.

Instead of passing the material through the retort at a uniform speed, the patentees submit the same to a longer or shorter heat treatment under suitable varying temperatures, and claim greatly improved results.

The rate at which solid material travels through a rotary retort depends upon the speed of rotation and also upon the inclination of the sides towards the horizontal. The process may be carried out, according to the invention, in a rotary retort in which the axis is inclined at a suitable angle towards the horizontal, and built up from a convenient number of cylindrical and conical retort sections placed end to end in such manner that a number of zones are formed which serve either to retard or accelerate the rate of travel of the material through the retort.

According to a further feature of the invention, the interior of the retort is provided with shelves or baffles which are preferably located diametrically across the retort; the shelves being preferably of triangular section, provided with suitable perforations, and disposed at any suitable angle with respect to one another and also to the horizontal. Adjusting means may be provided. The specification details an arrangement of the baffles which gives the desired result of good distribution and varied speed through the retort.

The zones may be formed by the metal sections themselves which constitute the walls of the retort, or the walls of the retort may be cylindrical and the inclined or horizontal portions may be constituted by a firebrick lining of suitably shaped bricks. In certain cases a combination of these two arrangements may be adopted.

A further feature of the invention is that the retort is provided at different points towards its discharge end with exit doors or passages which, in the case of an internally heated retort, communicate with a so-called sealing chamber. By providing these exit openings with screens or gratings of different sizes, or making the openings themselves of different areas, the smaller particles of material can be withdrawn from the retort before the larger particles. The sealing chamber may be divided into sections so as to separate the material discharged through one size of screen from the material discharged through a grating of larger mesh; and separate doors may be provided for withdrawing the graded material from the several sections of the sealing chamber.

As certain bituminous coals become very sticky and coagulate or adhere to a considerable extent during the passage of the material through certain temperature ranges or zones in the retort, according to another feature of the invention a certain proportion of fully or partly carbonized particles of breeze (obtained, for example, from the first section of the cooling chamber) may be admixed with the bituminous coal either at the entrance of the retort or at any portion where excessive coagulation is likely to occur. [This feature, say the patentees, may also be applied to vertical retorts, or provision made for feeding breeze or some similar fully-carbonized substance into the vertical retort so as to form a lining between the central mass of material and the inside wall of the retort.] Prongs or short curved shelves may be arranged in the sticky zone of a rotary retort to pick up agglomerated pieces. These are carried to the top of the retort, and fall through a certain distance, thereby breaking up.

The process is preferably carried on in a rotary inclined retort which is heated internally by producer or water gas drawn from an adjacent producer and passed unburnt through the retort, so that only its so-called sensible heat is utilized for effecting distillation. Gas tight connections for the inlet and exit gas-pipes are obtained by the use of piston rings. A screw feed may be provided and located within the gas pipe at the entrance to the retort for regulating the feed of material from a charging hopper to the interior of the retort.

Wet Meters.—No. 202,758.

COWAN, Sir H., and PARKINSON and W. & B. COWAN, LTD., both of Kennington Road, S.E.

No. 15,456; June 1, 1922.

The object of this invention is to provide an improved or modified meter.

The invention in the first place consists in a wet gas-meter comprising in combination a measuring apparatus of the duplex drum type and means for maintaining the water-level in the drum chamber on the bird-fountain principle to counteract the effect of evaporation. There are also a special form of spout for conveying the gas into the duplex drum, and a modified arrangement of bracket for supporting the front end of the drum spindle.

The spout comprises a horizontal tube open at both ends for the passage of the drum spindle and an annulus open towards each end—at one end by way of a connection placed at a decided angle (say 130°) projecting downwardly to convey gas from the waste-water box to the annulus, the opening at the other end by way of a substantially upstanding connection conveying gas from the annulus into the measuring drum. The special bracket is formed in two pieces screwed together and to the vertical division plate; this forming a support of the front end of the spindle encased within the spout.

Gas Cooking Stoves.—No. 203,083.

AIRD, K., of Falkirk.

No. 16,253; June 12, 1922.

This invention relates to details in the design and construction of gas-cookers, and a clear description would be difficult without reproducing the majority of the thirteen drawings which accompany the specification.

The object is to construct various parts of a gas-cooking stove in a simple and more effective manner than heretofore, whereby a removable tube is provided in the front, just below the oven door, connecting with the main and the two oven burners. The back, front, sides, and oven lining are connected together with strengthening rods or strips, and a loose oven top is provided, whereby it can easily be inserted and removed from the stove for cleaning purposes without disconnecting any part and without weakening the frame or complicating the construction in any way.

The claims of the patentee are for the following features in combination: A removable tube connecting the gas-supply branch pipe with the oven burners and supplied with injectors positioned coincident with the burner tubes, and capable of being fixed to the frame; a front constructed as a frame for the door, and a back comprising a sheet having the flue opening; the side panels and the liner connected by strengthening pieces engaging bent side edges of the liner and the panels, and screwed to the front and back; the back liner connected to the side liner by their side edges, which are bent together; a frame securable to the upper part of the oven wall or frame and a removable under top plate or oven top carried by the said frame; an opening between the frame and under top plate along one edge or portion for escape of hot vapours to the flue, the under top plate being removable without dismantling the stove.

Grids for Gas-Purifiers.—No. 203,216.

SPENCER, S. E., of Elland.

No. 27,970; Oct. 16, 1922.

The patentee claims that by the construction of grid covered by this patent the grids are more durable, and will stand rough usage during the emptying of the purifier, that the efficiency of the latter is greatly increased, and that other economies in the cost of filling and emptying are effected.

The inclined or staggered longitudinal side bars supporting the horizontal crossbars are made of greater width and thickness than hitherto—preferably 4½ in. in width and 2 in. in thickness. In consequence of the increase in size in cross-section of these bars, a larger size of horizontal bar may be employed for supporting the filtering material, and preferably three or four in a full-size grid in accordance with the depth of the purifier to be filled. These bars are round in cross-section, but with a flat top equivalent to one side of a hexagon made from such a bar. This flat is of normal width and the principal support given to the filtering material; but the curved portions at each side above the horizontal diameter give a proportionate support and serve as abutments to set up the desired arches in the purifying material.

If desired, the side arcs of the grid bar above the horizontal may be made plane or concave. The bars are wedged into the side beams.

The customary distance-pieces between the edges of the inclined bars may be in the form of a square or the like head corresponding at its greatest width with the thickness of such bar, and be dowelled into the edge, with the axis of one of its angles in a vertical position so as not to impede the fall or the distribution of the filtering material entering the purifier.

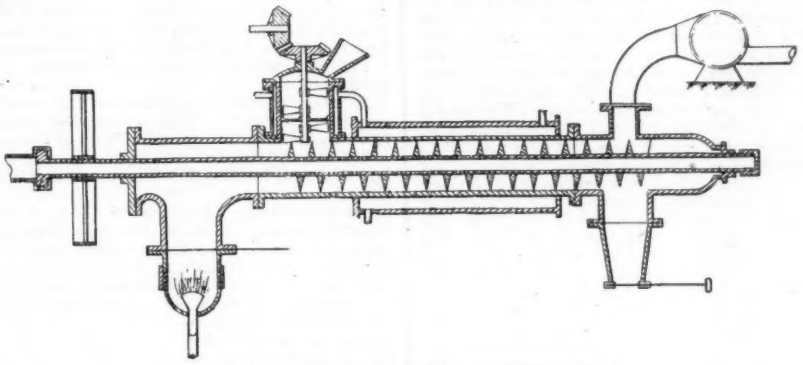
Sulphate Preparation.—No. 203,013.

THWAITE, A. H., of Crook, and PEASE & PARTNERS, LTD., of Darlington.

No. 11,196; April 21, 1922.

This invention seeks to provide apparatus whereby acid salt can be quickly, effectively, and economically converted into dry, ground, and neutralized sulphate of ammonia.

A drying cylinder is provided with a hollow shaft or conduit formed with numerous perforations through which the gaseous neutralizing agent employed—for instance, ammonia, or coal or other gas containing ammonia—can be caused to flow into the drying cylinder and come into intimate contact with the acid salt. The feeding means may be an archimedean screw or rotary conveyor carried by the hollow perforated shaft, which is then mounted to rotate in the drying cylinder. The drying cylinder may conveniently be provided with a steam jacket for heating it, as also may the inlet hopper. Means may also be provided for supplying hot air or gaseous medium to the inlet end of the drying cylinder, and at the outlet end for withdrawing any surplus. Reference to the longitudinal section reproduced will make the apparatus clearly understood.



Sulphate Plant—Pease and Partners, Limited.

It will be noticed that the acid salt to be treated is charged into the drying cylinder through a hopper provided with rotary feeding blades fixed to a shaft supported laterally by a bearing and driven through gearing; while the outlet hopper is controlled by a slide valve.

Hot air, mixed with products of combustion, is supplied by means of a bunsen burner arrangement, and is controlled by an annular regulator and a slide valve or damper.

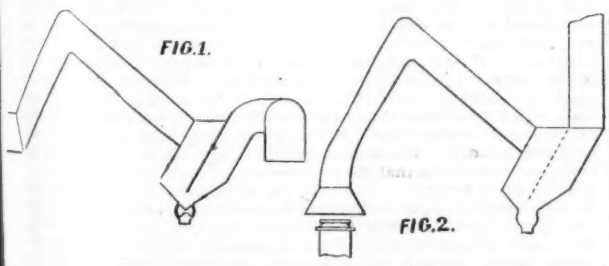
The right-hand section of the drying cylinder is provided with an upwardly extending branch for connection to a fan which withdraws the surplus gases.

Treatment of Smoke and Fumes.—No. 203,111.

TOOTH, L. F., of Wanstead, E. 11.

No. 18,006; June 30, 1922; No. 28,842; Oct. 24, 1922; No. 9209; April 13, 1923.

This invention relates to the treatment of smoke or fumes with the object of eliminating solid matters therefrom, and comprises improved means for the purpose. The patentee remarks that one of the chief sources of trouble with smoke, particularly that from furnaces working under forced draught, is due to the carrying-off by the smoke of particles of solid matter more or less of a gritty character, some of which matter is deposited in the vicinity of the chimney or stack and gives rise to difficulties or inconveniences on the works concerned; but, what is more serious, owing to its light character the matter may be disseminated and deposited over a wide area, causing annoyance beyond the works.



Tooth's Smoke Arrester.

The invention comprises an abruptly-bent flue having two limbs inclined downwardly from the bend, associated with a box or chamber fitted with a baffle; the arrangement being such that the smoke or fume passes upwardly through one limb and is abruptly diverted at the bend through the other limb and is directed thus against the baffle in the box.

Fig. 1 shows one form of the invention (as applicable to a boiler-furnace); and fig. 2 shows its modification for use with a water-gas plant.

In the latter case, the limb is connected to a hood arranged above the usual stack and valve, the form of the flue being similar in outline to that shown in fig. 1. In order to ensure an effective draught, the limb is formed with a contracted portion which constitutes a sort of venturi tube.

Water and Gas Supply Valves of Water-Heaters. No. 203,261.

EWART, J. W., of Euston Road, N.W. 1.

No. 35,028: Dec. 22, 1922.

This invention relates to the fittings for the water and gas supply valves of geysers of the type wherein a valve controlling the supply of gas is automatically opened by the flow due to the turning-on of the water supply.

Such fittings, it is pointed out, are generally in the form of an upright tube having a partition therein so as to form a chamber at the lower part, to which is connected a gas-supply cock, the lower part of the chamber opening into the gas-pipe and containing a disc valve normally closing the said pipe. This valve has a central stem passing up through the partition and is provided with a disc or float fitting loosely within the upright tube. Beneath the float is an opening connected with the water-supply pipe; and the water, when turned on, forces the valve upwards against the pull of a spring until it opens into a portion of the upright tube of larger diameter than the valve, so as to allow the water to pass.

Such construction, however, possesses the disadvantage that if at any time the gas and water valves become defective, it is necessary to detach the upright tube from the various pipes with which it is connected, in order that the valves may be attended to.

According to the present invention, the gas and float valves are carried on a stem axially movable in guides in a tube or liner designed to be placed within, and secured to, the upright tube in such a manner as to be capable of easy removal therefrom. By this means, it is not necessary, in order to repair or replace the valves, to disconnect the upright pipe from the gas and water fittings to the heater; the liner and valves being simply removed after unscrewing a retaining cap.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 3.]

Nos. 23,761 to 24,316.

BANKS, C.—"Gas-tap." No. 24,151.
BRITTAIN, E.—"Gas-lock." No. 23,968.
BROWN, J.—"Gas-injectors for gas-fires." No. 24,092.
CLARK & CO., LTD., P.—"Automatic gas-leak alarm." No. 23,818.
CROWLEY, V. J.—"Gas flex tube cock." No. 24,013.
DEAN, W.—"Gas washing-boilers, &c." No. 24,292.
DOCKREE, M. I.—"Gas-fittings for inverted incandescent burners." No. 23,914.
DOCKREE, M. I.—"Incandescent gas-burners." No. 23,915.
EDWARDS, E. E.—See Clark & Co., Ltd., P. No. 23,818.
FLAVEL, P.—"Gas, &c., cooking-stoves." No. 24,172.
FRANCIS, W. R.—"Gas-fire radiants." No. 24,243.
GENERAL GAS APPLIANCES, LTD.—See Francis, W. R. No. 24,243.
GUMBLEY, J. P.—"Compound for detection, oxidation, or combustion of inflammable gases." No. 24,228.
HALL, J. A.—"Means for measuring flow of gases." No. 24,207.
KEITH, G., and KEITH & BLACKMAN CO., LTD., J.—"Air and gas mixing-apparatus." No. 23,960.
MACMILLAN, D.—"Gas-burners." No. 24,185.
SIMON, LTD., H.—See Hall, J. A. No. 24,207.
SOC. HARDOLL.—"Recording-meters for liquids." No. 23,894.
SULZER BROS., LTD.—"Containers for dry-cooling hot coke, &c." No. 23,809.
WALLET, M.—"Gas-producer." No. 23,958.
WEST, G.—See Macmillan, D. No. 24,185.
WILSON GAS-METERS, LTD., G., and WILSON, J. H.—"Coin-freed mechanism." No. 23,867.

RESTORATION OF LAPSED PATENTS.

Notice is given that an order was made on Sept. 24, 1923, restoring each of the under-mentioned letters patent granted to James Leary Jackson: "Improvements in valves," July 31, 1916; "Improvements in gas cut-off apparatus," Feb. 8, 1915; "Improvements in gas shut-off valves," Aug. 20, 1914.

Mr. Charles Wood, the Bradford City Gas Engineer and General Manager, has reported to his Committee that gas coal required for the next six months has been purchased at an average price of 22s. 9d. per ton delivered, a reduction of 1s. 8d. per ton.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following notice has appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

DECLARATION OF CALORIFIC POWER.

Taunton Gas Light and Coke Company.—525 B.Th.U. in substitution for 460 B.Th.U. (Jan. 1, 1924.)

SETTLEMENT OF NOTTINGHAM STRIKE.

After a strike extending over a period of sixteen weeks, the dispute affecting a relatively small proportion of men employed by the Gas Committee of the Nottingham Corporation has been settled, by the disaffected hands returning to work upon conditions which are designed to effect a settlement of a permanently satisfactory character. The trouble arose originally out of the claim which was put forward by the men to be treated, in regard to rates of remuneration, upon the basis of skilled plumbers; the contention being seriously contested by the Committee in the interest of the gas industry as a whole. The matter has engaged the attention of the National Joint Industrial Council, whose views were in agreement with that of the Committee; and thus a question giving rise to issues of a widely applicable nature had become involved. A further difficulty had occurred through a clashing of trade-union interests; the men affected, who originally belonged to the Union of General Workers, having thrown in their allegiance with the National Federation of Building Trade Operatives. The Gas Committee had made it manifest, at an early stage of the dispute, that while they were quite willing to enter into negotiations, it was impossible for them, as matters stood, to determine which of the organizations had power to conclude an agreement. Recent developments have, however, demonstrated that the Federation representative of the building trade employers was prepared to take the whole responsibility; and following an abortive visit to Nottingham of a deputation accredited to act on behalf of this body, a threat was made to withdraw the whole of the employees engaged on building operations in the city. But the decisive factor in the matter was the attitude taken by the building trade employers themselves, who determined that unless the strikers discontinued the aggressive tactics, which the Nottingham and District Association of Building Trades' Employers complained had been used against them, the whole of the operatives, numbering over 8000, would be served with lock-out notices, and the doors of the workshops closed against them on Oct. 8. Such a contingency, at the present period of abnormal stress, could not be viewed with equanimity; and the gas employees agreed to resume work under conditions which left several matters of detail open for further discussion with the Gas Committee. As a matter of fact, the men have gained little from their long-sustained obduracy; and the services of many of them might have been altogether dispensed with had the Committee cared to prolong the controversy.

PLYMOUTH GAS-WORKS LOAN.

An inquiry was held at Plymouth, last Wednesday, by Major J. Stewart, R E., into the application of the Corporation for sanction to raise a loan of £19,340 for gas works purposes.

The Town Clerk informed the Inspector that the application was for an additional unit of carburetted water-gas plant, to enable the present units of plant to be properly overhauled, which, as in the case of the retorts, had not been possible owing to the continued demands on the plant to meet the requirements of consumers. The additional unit would have a manufacturing capacity of 1,200,000 c.ft. per day, and money was also required for the provision of an exhauster, washer, and mains. The introduction of the additional unit of carburetted water-gas plant would assist in absorbing a larger proportion of the surplus coke produced in the retort-house. Owing to the lack of large concerns in the Plymouth district, difficulty was experienced in disposing of the coke; and its consumption for gas making reduced the quantity of gas coal to be purchased. This outlet for coke enabled its market value to be maintained for actual sales, which was ultimately reflected in the selling price of gas. The loan would make no charge whatever on the rates. Under the provisions of the Plymouth Corporation Act, any money needed for such purposes as this would have to come out of the reserve fund; and if there was not sufficient money there, it would be taken as a loan from the district fund and repaid later out of revenue.

Mr. W. P. Tervet (the Gas Engineer) stated that, assuming the annual increase of 10 p.ct. in gas consumption was maintained, the proposed extension would carry the undertaking on for six years. The water gas manufacture would be in the present proportion of 50 p.ct., and all gas distributed for domestic purposes would have the distinctive smell of coal gas.

No opposition was forthcoming to the application.

Price of Gas at Stafford.—At the Stafford Town Council meeting last week, Mr. G. Owen called attention to the price of gas. He said the profit and loss account in respect of the Corporation gas undertaking last year showed that there was a profit of £22,762. Apart from this, he found that £2276 was paid in income-tax. On the account sheet that day, there was a sum of £1047 in respect of income-tax. The Corporation were again making an enormous profit on the gas undertaking; and he considered the price of gas should be reduced.

MARPLE GAS ORDER.

An inquiry was held by Mr. H. C. Honey (Director of Gas Administration at the Board of Trade), last Friday week, in the Union Rooms, Stockport Road, Marple, into an application by the Marple Urban District Council, as owners of the local gas undertaking, for a Special Order under section 10 of the Gas Regulation Act. The objects of the Order are: First, to authorize the Council to acquire a small undertaking carried on and owned by the Calico Printers' Association, Ltd., under the Compstall Gas Order, 1909, and to supply gas in the parish and urban district of Compstall, in the County of Chester, and part of the township of Ludworth, in the rural district of Glossop Dale, in the County of Derby; and, secondly, to enable them to secure additional land for the extension of the gas-works. Objection to the granting of the Order as drafted was entered by four Railway Companies and two County Councils. Various property owners in the neighbourhood of the works objected to the acquisition of the land specified for gas purposes.

Mr. Jacques Abady (instructed by Messrs. Sharpe, Pritchard, & Co., of Westminster, as Agents for Messrs. Johnsons, of Stockport) represented the Marple Urban District Council. There were also in attendance Councillor Joseph Smith (Chairman of the Gas Committee) and Councillor Hugh Rodger, of the Marple Council, with Mr. James Kay Law (their Gas Engineer), Mr. James Freeman (the Clerk), and Mr. E. H. Brogden (Valuer to the Hayfield Union Assessment Committee).

Sir Harry Courthope-Munroe, K.C., and Mr. H. F. Bidder (instructed by Messrs. Beale & Co., Westminster) appeared for the London, Midland, and Scottish Railway Company; the Great Central and Midland Joint Committee; the London and North-Eastern Railway Company; and the Great Central and North Staffordshire Committee.

Mr. John Grace (Barrister, of Chester) represented the Cheshire County Council; Mr. H. W. Skinner (Deputy Clerk), the Derbyshire County Council; and for property owners, Mr. Adrian Smith (Solicitor, Hyde) and Mr. Edward Helm (Solicitor, Stockport).

Mr. Abady, in opening, said that, in addition to the parties appearing that day, there had been other opposition, which was disposed of by concessions made by the promoting Council. There had been opposition by the Hyde Gas Company; but this had been disposed of. Substantially the objects of the Order were two-fold. The first was to acquire additional land which adjoined the existing gas lands, and to take power to manufacture and store gas thereon; and the second was to acquire an undertaking powers to direct which were given to the Calico Printers' Association, Ltd., by the Compstall Gas Order of 1909. There was no opposition to the proposal to take over the Compstall Gas Order; but there was opposition to the suggested use for gas purposes of land for the purchase of which a provisional agreement had been entered into. Thus the real gravamen of the inquiry had been brought down to the point of the position of owners of adjoining land and houses; and in order that a decision might be come to on the matter, he was sure it would not be thought that he was going beyond the scope of the inquiry if he presented some of the salient facts connected with the undertaking, which in his judgment it would be necessary for the Director to have in mind. This was an undertaking which was many years ago owned by the Marple Gas Company, Ltd.; and under the Marple Local Board Gas Act of 1886, the concern was transferred to what was now the Marple Urban District Council. By section 5 of that Act the limits of supply were defined. First of all there was Marple, in the County of Chester. Then there was the district of Ludworth, which was outside the Local Government area of the district, and was in the County of Derby; also Mellor, which was south of Ludworth, and up to the north a district which had never yet been supplied—both in Derbyshire. This was not a question of an urban district going beyond its area for gas supply for the first time. Its area always had been more outside the administrative area for Local Government purposes than inside that area. It was merely adding a district which was advantageous to it from every point of view. The area it was proposed to take over was now supplied with 5½ million c.ft. of gas a year. In order to give effect to the transfer, a provisional agreement was entered into with the Calico Printers' Association, dated Nov. 2, 1922. The other question he had to deal with was that of the land. The matter of the acquisition of land was considered by the Urban District Council in 1919, and instructions were given for the promotion of a Provisional Order to secure land and manufacture and store gas. The taking-over of the Compstall Order had merely added to the necessity for the extra gas land. It was not primarily responsible for the acquisition of the land, which was due to increased consumption and the congested state of the present works. The Council asked for powers to acquire the land and manufacture and store gas upon it. These clauses were in model form, and contained nothing novel.

There never was a case in which the acquisition of a piece of land was less harmful to the occupants of property adjoining, because the land which it was proposed to take over sloped away at a very steep angle, and the use to which it was likely that it could be put by the Urban District Council was one which could not possibly affect the amenities of the houses. As far as contiguity to a gas-works was concerned, it must be remembered that the dwellings were near a gas-works now, and were mostly built after the works had been acquired by the Marple Urban District Council. Thus it was not a question of the gas-works coming to the houses, but of the houses coming to the gas-works. He would call evidence as to the chance of the property being materially affected, and the value reduced, by the extension of the gas-works. He understood that during the whole of the time the present Engineer had been connected with the undertaking, there had been no complaint of nuisance arising from the works. Financially the undertaking was very sound. There had been raised by loan £27,000, of which there remained outstanding some £15,000. There was a balance in net revenue account of £6362. The Urban Council had put in a clause that would give the County Councils the same protection they had always had; but what the County Councils were asking was that the terms of this protective clause should apply to the

whole of the remaining area—that was, the present gas limits—of the Marple Urban District Council. Why they should ask for this he could not imagine. The position of the Urban Council as regarded roads, with respect to the existing area, would not be altered in the least. The Urban Council would remain in exactly the same position as they had always occupied, and so would the County Councils As to the added area, the County Councils would have the protective clause that was in the Compstall Order, but only because it was given before.

THE OBJECTION OF THE RAILWAY COMPANIES.

Mr. ABADY, proceeding to refer to the opposition to the Order of the various Railway Companies named above, said this had relation to clause 20, which was in the following terms:

> 20.—*As to Mains of Insufficient Capacity.*—Notwithstanding anything contained in any enactment to the contrary, the Council shall not be obliged to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of such main is at the date when such notice is served insufficient for such purpose, or if and so long as any such supply would in the opinion of the Council interfere with the sufficiency of the gas required to be supplied by means of that main for lighting or domestic purposes.

The substance of the objection of the Railway Companies, he said, seemed to be, first, that this was a war-time clause, and, secondly, that it was unnecessary. One of the Railway Companies had made a suggestion that, if the clause was granted, there should be something added so as to make it clear that it had no application to a section which gave the Council power to supply gas in bulk by agreement. It was not a model clause; but it was of very usual application. It was really based on one of the model clauses which related to the supply of water. His own book on "Clauses and Precedents in Electricity, Gas, and Water Legislation" (paragraph 757) showed that there were various precedents. So far as he knew, it was first inserted in the Swansea Gas Act of 1911; while other cases were the Annfield Plain and District Gas Act, 1912; the South Staffordshire (Mond) Gas Act, 1913; the Tynemouth Gas Act, 1913; the Westgate and Birchington Gas and Electricity Act, 1913; the Isle of Thanet Gas Act, 1914; and the Longwood and Slaithwaite Gas Act, 1914. These were through Committee before the war broke out. Since the war, he had noted various instances—among them Ascot, Brighton, Doncaster, Ilfracombe, Ferndale, and Uxbridge. Subsequently, he thought he might say, it had been general in Gas Acts. The Council did not want to be under an obligation to supply gas for other purposes, if it would interfere with the supply for domestic purposes. If there were ample precedents, he imagined the Board of Trade would require some special evidence to induce them, on the motion of the Railway Companies, to depart from what had become a common clause.

Sir H. COURTHOPE-MUNROE: I am taking the bold course, Sir, of asking you to strike the clause out. That is the broad, main issue I am here for. Continuing, he said he wanted to be left on the lines of 1871. The original objections of the four railway undertakings for whom he appeared had also covered several other clauses; but these had been met, and they were now faced with the clean issue of clause 20. All these attempts to cut-in on the statutory position of consumers did not come like a "bolt from the blue." They came bit by bit; but there ultimately arrived a time when those affected woke up to the position, and had to determine whether they would allow precedent after precedent to be created which might later on seriously affect them. In the original Gas-Works Clauses Act of 1847 there was no obligation upon a gas company to supply gas to anybody. It simply gave the people who went in for gas undertakings a right to make contracts to supply gas. In 1871, however, another Gas-Works Clauses Act was passed, and Parliament gave effect to the considered policy that, when gas companies went in for Acts and Orders, it would be in terms, not of power to make contracts, but of obligation to supply consumers for all purposes. This had been the law of the country for something over half-a-century; and it was only of late years that an attempt had been made to cut-in on that statutory right of the consumer to have, as a right and not a favour, a supply of gas for all purposes. As he had said, these things crept on. His friend had mentioned a number of Acts or Orders from 1911 onwards, leaving off at 1916. But, of course, they had to carry on, and find out what the position was to-day. It was no use stopping at 1916. In this connection, they should consider what had been done in the cases of the Lea Bridge Gas Order, 1922, the Burton-on-Trent Order, 1923, the Bromsgrove Order, 1923, the Chesterfield Corporation Act, 1923, and the Barnsley Gas Special Order, 1923. The Barnsley Order was an appeal to Parliament from an Order of the Board of Trade, and was, he respectfully submitted, the last word on the subject, and furthermore was the considered decision of a Committee of Parliament. Having got the Barnsley Gas Order dealt with by a Committee of the House, and followed in the agreement with the Chesterfield Corporation, all the various steps up to that point were, to his mind, of no importance. The value of these things rested entirely on a fight, where both parties were heard, and a conclusion was arrived at. Multiplying them bit by bit, by consent, really came to nothing. It was common ground, he thought, between his friend and himself that up to the Swansea case in 1911, the position registered by Parliament in 1871—an obligation to supply for all purposes—obtained. The broad thing had gone on for fifty years. It might be that at the time it was worth nobody's while to fight the matter. There were subsequently certain cases of agreement; and then they came to the post-war period, when there were the five cases to which he had referred. The Burton-on-Trent Order was fought before the Board of Trade, with the result that protection was afforded as regarded bulk supply. Then they came to the Barnsley Order, which the Railway Companies fought before the Board of Trade, and failed. This Order was duly made by the Board of Trade, laid on the table of the House, and then objection was taken to it in the House of Commons, and it was sent to a Special Committee (with Mr. Pennefather as Chairman), in the same way as a Private Bill. This gave the Railway Companies an opportunity of re-opening their case and appearing by Counsel, which they did; and when the matter had been thoroughly threshed out, the Committee made certain recommendations. Therefore he thought he could fairly say that, for the purpose of ascertaining what was the minimum protection to which the Companies were entitled, it was idle to go into all these various other Acts and Orders, because the whole of the matters had been considered by Parliament, who had said, in effect: "These things shall not go forward without these provisos." His first proposition was that the very minimum to which the Railway Companies were entitled was the protection given by the Committee on the two points he had in mind—insufficient mains and bulk supply; but he was going further to contend that the only safe position for consumers was to ask the Board of Trade, and if necessary Parliament, to say that the considered policy of Parliament in 1871—that there should be an obligation to supply gas for all purposes—should be maintained in its integrity, and should not even be whittled away to the extent of the protection that had been given by the Committee of the House. In the Barnsley Order, to section 25, authorizing the supply of gas in bulk, was added the same proviso that the Board of Trade had put in the Burton Order: "Provided that the Company shall not supply gas under any such contract beyond the limits of supply if and so long as such supply would interfere with the supply of gas within those limits." On this point, the Committee approved the Board of Trade's action, and inserted the Burton clause in the Barnsley Order. So far, so good. It should be pointed out that there was no bulk supply clause in the Order that was being dealt with that day. It was, however, to be found in the earlier measure. Clause 20 of the present Order was exactly the same as clause 30 of the Barnsley Order, which had added to it by Parliament: "Provided that this section shall not apply to any main used by the Company for the supply by them of gas under a contract entered into under section 25 [the supply in bulk clause] of this Order." Therefore he argued that any bulk supply clause or any insufficient mains clause must have the limitations put upon the Barnsley Order. The Chesterfield Corporation Act of 1923 went through with both the provisos recommended by Mr. Pennefather's Committee put in.

Mr. HONEY: Do you know what happened in the case of Macclesfield? My recollection is that in the Macclesfield Bill, which was before the Local Legislation Committee this year (and I think perhaps in the Rawmarsh case) the clause in the form in which it appears in this Order was allowed.

Sir H. COURTHOPE-MUNROE: Was that before the decision of Mr. Pennefather's Committee, or after?

Mr. HONEY: I think in one instance, at any rate, it was after. The only reason I refer to the matter is this: I imagine that, a case having been fought in Parliament, the Board of Trade would necessarily take the decision of the Committee as a direction to them for future Orders; but if you have two Committees of Parliament dealing with the matter in two different ways, then the direction would only amount to this—that the Board of Trade must consider whether, in the particular case, this proviso is required.

Sir H. COURTHOPE-MUNROE: I am not suggesting that the Board of Trade could not do so. The matter, I am told, was discussed in the Barnsley case as a question of principle. Continuing, Sir Harry said the Chesterfield Corporation accepted the Barnsley provisos; and he did not think there had been any Act passed subsequently giving the two clauses referred to without adding the safeguards put into the Barnsley Order. The Nelson Corporation and the Hyde Gas Company had a clause similar to what Mr. Abady was asking for; and they had agreed to delete it. His interest in this particular case certainly did not warrant the expense to which the Railway Companies had gone; but the great danger of allowing these cases to go through without a struggle for one's rights was the piling-up of precedents.

Mr. *William Goodchild*, M.Inst.M.E., Gas Engineer to the Midland Division of the London, Midland, and Scottish Railway, examined by Mr. BIDDER, said the Railway Companies used gas for power in various parts of the country; and there was no reason why this use should not be extended. They found it an advantage to instal a gas-engine in some cases instead of a steam boiler. He feared the danger of a precedent in an Order like this, even though existing requirements in the district were small. If clause 20 was enacted throughout the country, they would be deprived of any security for their industrial supplies of gas. They would be entirely in the hands of any gas undertaking who had a clause of this kind. The principal danger of the clause was that it was linked with the bulk supply. The Gas Regulation Act imposed upon a gas undertaking the obligation of maintaining a higher minimum pressure than was usual in the past; and in many parts of the country mains sufficient to maintain the old pressure would not be large enough under the new enactment. If a certain main was carrying a big industrial supply, the cutting-off of that supply would ease the strain on the main. This section would enable the Council to cut out existing consumers if the new pressure could not be maintained in the main.

Mr. ABADY said his instructions were that the pressure at present was 2 in.

Witness, replying to Mr. ABADY, agreed that there was nothing personal against Marple. The use of gas for industrial purposes had certainly developed since 1871.

Mr. ABADY: Would the Companies be satisfied with a proviso similar to that quoted to clause 20 here?

Sir H. COURTHOPE-MUNROE: No.

Mr. ABADY: We have not the slightest objection to a proviso like that, because it does not alter our obligation under a contract, nor does it increase our obligations. We are perfectly willing to take the Barnsley proviso; but we object to clause 20 being struck out.

Mr. HONEY: Did you petition against any Bills this session?

Witness: I believe we petitioned against Chesterfield.

Sir H. COURTHOPE MUNROE: At first everybody thought if they got what had been given in the case of Burton, that was enough; but after the Barnsley clause, they felt they ought to ask in future for the old conditions.

Mr. HONEY: So far as this particular undertaking is concerned, it does not matter to you much one way or another?

Witness: We have not a large industrial use of gas in Marple.

Mr. HONEY: It would be very much better that this rather important point of principle should be dealt with by a Parliamentary Committee.

Sir H. COURTHOPE-MUNROE: We are here for the purpose of preventing the decision being given that this is the right thing to do. If you are against us, we shall have to go on with the matter; but I do urge you to say that the time has now come when this clause should be struck out.

Mr. ABADY: We have no personal interest in this clause; but when the Railway Companies raised their opposition, we felt it was not right to give way on a question of principle. There is not the slightest intention of interfering with an existing contract or supply; but it is intended that the clause should prevent anybody demanding an unreasonable compliance with the letter of section 11 of the Gas-Works Clauses Act, 1871. If you feel that you would rather not decide this point, then, so long as it is made clear that the clause is not withdrawn at the demand of the Railway Companies, we are willing to let it go.

Mr. HONEY: My difficulty is that what I am asked to do is not to deal with this specific case on its merits as regards Marple, but to treat it as a test case, and say that the clause ought to be struck out.

Sir H. COURTHOPE-MUNROE: My friend has declared that everything he has said is general, and has no special application to Marple. Therefore I say there is no reason for including such a clause in the case of Marple.

Mr. HONEY: Of course, the decision must rest entirely with the Department; but I should be perfectly prepared to recommend them to put in the Barnsley amendment. That is, however, I think, not very satisfactory to anybody. I have never been able to understand what that amendment means; but Parliament inserted it, and we must take that at any rate as a direction from Parliament. I do feel a difficulty with regard to the clause. First of all, the analogy with the water clause is quite a false one. The water clause was a matter of public health, whereas this is a different thing. But I do think that the more stringent conditions which have been inserted for the protection of consumers in the Act of 1920 involve a clause more or less on the lines of clause 20 in this Order. At the same time, my own feeling is that the clause is not sufficiently safeguarded—that the consumers who would be affected by the clause have not quite sufficient safeguards. It safeguards the general body of consumers, but at the expense of somebody who probably ought to have some greater protection. The Council, ably as they are represented here to-day, have not themselves the technical knowledge and the broad interests which would justify my suggesting that you should hammer out some clause which would be generally acceptable.

Sir H. COURTHOPE-MUNROE: Then how dare they come here to try and wipe out my rights?

Mr. ABADY: Will you give an opportunity to the promoters to submit an amended clause?

Mr. HONEY: What was in my mind was to insert the clause with the Barnsley amendment. But I should like it to be made quite clear that it is not a decision on the actual merits of the clause—not a decision that would bind the Railway Companies or the Department in any other case.

Sir H. COURTHOPE-MUNROE: We are so afraid of precedents being built-up. What I should have liked you to do, if you will not strike out the clause, is to have got rid of this thing in the clause about "in the opinion of the Council"—"if and so long as any such supply would *in the opinion of the Council* interfere with the sufficiency of the gas required to be supplied by means of that main for lighting or domestic purposes." It is absolutely unfair to make any persons judges in their own cause. A small consumer might be hit as well as a big one. I am here asking you to strike the clause out.

ARGUMENTS FOR THE COUNTY COUNCILS.

Mr. JOHN GRACE then put in jointly on behalf of the Cheshire County Council and the Derbyshire County Council a series of clauses for their protection precisely similar to those submitted by him the previous day at the inquiry relating to the application for a Special Order of the Hyde Gas Company, and some portions of which the representatives of that Company signified their willingness to accept [*ante*, p. 67]. He said that in the Marple area there were main roads extending to 4 miles odd, and in the Compstall area main roads to the extent of 110 yards. There were also bridges. It was his submission that the clauses which they asked should be inserted in this Order should apply not only to the Compstall area, but that they should extend also into the Marple area. The Kidsgrove Gas Act of 1914 was on all fours with his present position. In that case, the Kidsgrove Gas Company, just on the borders of Cheshire, supplied three villages in Cheshire with gas. They applied for an extension of their gas limits; and this extension included a village in Cheshire. The County Council sought for an amendment of the Gas-Works Clauses Act, 1847, with regard to the roads, and asked that it should not only apply to this village, but to the whole area of the Kidsgrove Gas Company. The matter went before a Parliamentary Committee, who inserted in that case clauses almost identical with the ones which it was now sought to have included in this Order—and clauses to affect the whole area of the Kidsgrove Gas Company. Therefore there was a definite precedent for what the Councils were now asking. Though they were not road authorities, they were the people who paid; and he submitted that they were entitled to be heard on a matter which affected the whole of the ratepayers of the county. In 1910, the year following the passing of the Compstall Gas Order, the cost of main roads in Cheshire amounted to £97,000; last year the cost had increased to £356,000. Thus it was a very serious question for the county. For one thing, they desired that the position in a road, and the depth, of a pipe should be under the control of the County Council. In many cases this had been inserted; and he could not understand why there should be any opposition now—particularly seeing that they had almost identically the same clause in the Compstall section. He submitted that there should be one set of rules with regard to the laying of pipes to relate to the whole area of the undertaking—not one for Compstall, and another for the other part.

Mr. *G. E. Ashforth* (Assistant County Surveyor) gave evidence bearing out the opening of Counsel.

Mr. HONEY: What sort of control do you want that you have not at present?

Witness: We want more extended and more definite control. We want to be able to define exactly the position and depth of any pipe. If new pipes had to be laid in place of pipes at present in the middle of the road, it might be advisable to find a fresh position, where they would be out of the way of traffic or of any proposed improvement.

Do you think the Marple Council would be likely to disagree with you on that?—At present, if the Council wished to lay or renew a pipe, they could do so without the County Council's knowledge.

Mr. ABADY suggested that the Council had the power they desired if and where they were the road authority; and there was no reason why they should have the power in respect of roads over which they were not the road authority.

Mr. HONEY said the point was rather one for the Royal Commission on Local Government. As a matter of fact, the County Councils were asking the Board of Trade to decide a question that was under consideration by this Commission. If clauses were agreed, no doubt they would be inserted; but unless they were agreed, he thought the policy of the Department was not to put them in. In this particular case it was clear that what was desired was an amendment of the general law affecting the relations between the County Council and the Urban Authorities on a matter which was under consideration by a Royal Commission at the moment. It was extremely unlikely that, in a matter which was thus *sub judice*, the Board of Trade would take any action which could be construed as a decision in favour of either party.

Mr. GRACE: Would Mr. Abady meet us over the bridges, if we drop the part relating to main roads?

Mr. ABADY: I have no instructions; but something may be done between now and the final drafting of the Order.

Mr. H. W. SKINNER (Deputy Clerk to the Derbyshire County Council) said the main roads were definitely maintained by his Council, so that their position was rather different from that of the Cheshire County Council. The Marple Council had always taken a very fair and generous view of their obligations; but the County Council looked upon this more as a matter of principle than as one that affected the Marple Gas Authority in particular. The ground upon which they were asking for this protection was that there had been a tremendous change in road conditions since 1886; and road maintenance was entirely a different proposition now, requiring more adequate protection for the Council than was formerly called for. Clauses had been inserted in various Acts, whereby protective provisions were extended to old areas, so far as new pipes and mains were concerned. The promoters themselves, in their Act of 1911, conceded to an authority what the Council were asking should be conceded to them now.

Mr. HONEY: I think the proper course is to await the recommendations made by the Royal Commission.

GAS MANAGER'S EVIDENCE.

Mr. *James Kay Law* (Gas Engineer to the Marple Urban District Council), examined by Mr. ABADY, said he had occupied his present position for sixteen years. For the purpose of supplying the Ludworth and Compstall areas, the Council proposed to lay the necessary trunk main from their gas-works to the outlet main from the Calico Printers' Association's works. The length of the trunk main thus required would be 1160 yards, the cost of which was estimated at £1030. At present the Company's annual make of gas was just over 6 million c.ft. He was optimistic about the chances of increasing business in this area. Prior to the agreement for the acquisition of the Company's undertaking, the Council had already decided upon the necessity for extending their gas-works plant, as the economical limit of production in the retort-bench was being reached; and, with the proposed addition of the Company's area of gas supply, the need for further manufacturing capacity became urgent. The existing retort-bench contained six settings of six retorts in each. Five settings were fully employed last winter; and it was probable that six would be required during the coming winter. It was proposed to add four new settings of six retorts in each setting, which would thus provide a total of ten settings, or sixty retorts. The extension of the retort-bench would occupy the available space in the present coal store (which was really an extension of the retort-house), so that provision was made also for a new coal store, the floor area of which was 2600 sq. ft., giving a coal storage capacity per vertical foot of 60 tons. The maximum average height intended for stacking coal was 10 ft., and so the storage capacity would be 600 tons. A new boiler house, boiler, chimney, and extension of the coke yard, also urgently needed, would occupy the remainder of the available space for extensions on the present gas-works lands. Therefore it became necessary to provide land for future extensions. The maximum make per 24 hours was 220,000 c.ft., and the storage capacity was 110,000 c.ft. This was not adequate, and the holder capacity should be increased. The old idea was 24 hours' storage; but 20 p.ct. might be deducted from this. So far as present indications went, the first use that was likely to be made of the new land would be for the erection of a gasholder. An opportunity had arisen of obtaining this land on favourable terms. To his mind, the works contemplated would not interfere materially with the houses nearby. There might be some interference with the near view, but not with the distant view, owing to the difference of level. The total height of the two-lift holder would be from 50 to 60 ft., according to whether the tank was above or below ground.

Witness, in reply to Mr. SMITH, said he did not think the proposed work would depreciate the property around. He did not anticipate there would be additional smoke or smell arising from the extensions. They had increased from 23 million c.ft. to 45 millions in annual output during the last twelve years.

By Mr. ABADY: The increase since 1919 had been from 29 million c.ft. to 45 millions.

The case for the various objectors was then fully gone into; a number of them giving evidence. Afterwards,

Mr. ABADY said: Most of the houses were built with the knowledge that there was a gas-works there; and this must have influenced the price of the land and so on. The purchasers bought them deliberately, with this knowledge. I ask you to say that the Council have justified their application on the ground of the necessity for the use of this land; and that they have proved that the use they are likely to make of the land will not in any way depreciate the surrounding property.

Before leaving Marple, Mr. Honey inspected the gas-works.

INQUIRY AT LEEK.

A Ministry of Health Inquiry was held by Mr. H. E. BYRNE, M.Inst.C.E., at the Town Hall, Leek, into the application by the Leek Urban District Council for a loan of £22,500 for the purpose of providing a vertical-retort installation, and the reconstruction of auxiliary plant at the Leek Gas-Works.

Mr. H. HENSHAW, Clerk to the Council, said the margin of borrowing power for the purposes of the present application was £24,950. Referring to the financial position of the gas undertaking, he said that the balance standing to the credit of net revenue account at March 31 was £10,867. There were 2153 ordinary, and 2434 prepayment, consumers.

Mr. R. H. GINMAN, the Gas Engineer and Manager, stated that his reasons for recommending the proposed extensions were contained in his report, which was submitted to, and approved by, the Council on July 24. This report dwelt on the need for reconstructing auxiliary plant, and erection of new carbonizing plant, to replace the existing inclined retorts erected twenty-three years ago. The period of reconstruction would occupy twelve months. Mr. Ginman gave in detail the advantages claimed for the vertical-retort system, and stated that the figures shown were on the estimated carbonizing results on an annual make of 141,000,000 c.ft. These gave a calculated gross saving of £2142 per annum, which, with a deduction of £1881 for interest and repayment of loan over a period of eighteen years, left a net saving of £261. He stated that in his report and balance-sheet for the year ended March 31 it was shown that the amount repaid on capital account during the year was £2553, and the outstanding debt £48,824. The latter was equivalent to £370 per million c.ft. of gas sold and accounted for. There had been a decreased expenditure on the twelve months of £3589; and the net profit for the year amounted to £2508, against a net loss of £1989 the previous year. The gas made was 140,943,000 c.ft., compared with 132,487,000 c.ft. the previous year—an increase of 8,456,000 c.ft. The price of gas to-day was 3s. 6d. per 1000 c.ft, against 2s. 6d. in 1914.

In moving a vote of thanks to the Inspector, Mr. W. A. Furmston (Chairman of the Lighting Committee) called attention to the absence of the public and members of the Council, and said he thought this was a proof of confidence in the scheme and in the efficient manner in which the business at the gas-works was carried on by Mr. Ginman.

Luton Gas Company.

The half-yearly meeting of the Luton Gas Company was held on Sept. 28—Mr. J. W. Green (the Chairman) presiding. Mr. W. Phillips (General Manager, Engineer, and Secretary) read the Directors' report and statement of accounts for the half-year ended June 30. The quantity of gas sold showed an increase of 25,935,000 c.ft. as compared with the half-year ended June, 1922. Owing to reductions in price, the revenue from sales was less by £10,341; but this difference was more than compensated for by the lower cost of coal and the higher price of tar. In view of the successful results, it had been decided to reduce the price from the Midsummer readings from 8d. to 7d. per therm. In proposing the adoption of the report, the Chairman mentioned that the profits on the sale of tar alone had increased by £4000, and that the reduction in the price of gas would benefit the consumers to the extent of £6000. The reduction amounted to nearly 5d. per 1000 c.ft. The following dividends were passed: Class "B" preference shares, 2 p.ct.; class "C" preference shares, £2 10s. p.ct.; "A" ordinary, £8 5s. p.ct.; "D" ordinary, £6 15s. p.ct.; and "F" ordinary, £4 2s. 6d. p.ct.

Anthracite Miners' Dispute in America.

In the latest issue to hand of the "Gas Age-Record," Mr. Floyd W. Parsons has some calmer news to give regarding the United States coal situation, which, he says, has for the moment assumed a peaceful aspect. Important State and Federal officials brought sufficient pressure to bear upon the anthracite operators to compel them to alter their determined stand in opposition to any wage increase; and at the same time the miners gave up something of what they were struggling for—with the result of a probable settlement of the present difficulty. At the same time, he points out that, from the standpoint of the public, such a conclusion is far from satisfactory; for, unless something unforeseen happens, the price of hard coal will soon be advanced to meet the increased cost of production. Declaring that "again we are compelled to witness a disgraceful surrender of principle by political leaders who make a business of bidding for votes," he says the truth is that the present anthracite difficulty has been nothing more than a preliminary skirmish in the big battle that is soon to be waged about the coal industry. The miners' President was far-sighted enough to see defeat in a protracted anthracite strike at the present moment. What they have done is to establish to the satisfaction of everyone the fact that the principle of no arbitration is now an important plank in the general platform of the union. The result of the whole affair is a small defeat for the operators, a much larger defeat for the miners' union, and the usual cost to the people at large. The United States Coal Commission would be submitting their final report probably very soon after the date at which he was writing; and the chances were that this document would be the signal for the commencement of what will surely be a real coal battle.

Chiswick Eclipse.—A portion of Chiswick, W., was much inconvenienced last Saturday, about 7 o'clock, owing to a failure in the electric current. Shopkeepers whose premises were full of customers hastily sent for candles. The Kinema Royal was full of patrons when the current driving the machine failed. The failure, which was confined to part of the Chiswick High Road and Turnham Green Terrace, was due to a main fuse in one of the distributing boxes blowing out. The current was restored after about half-an-hour.

CHESTERFIELD GAS UNDERTAKING.

Renewal of Coal Carbonizing Plant.

A Ministry of Health inquiry was conducted at Chesterfield on Friday by Mr. A. W. BRIGHTMORE (Inspector) into an application by the Chesterfield Corporation to borrow £22,000 to cover the cost of renewing one-half of the coal-carbonizing plant at the Central Gas-Works.

Mr. H. DAVIES, the Borough Gas Engineer, stated that the original estimate of the cost of the scheme was £30,000; but it had been found possible to reduce this amount by £8000. The application was made because the present coal-carbonizing plant was not only out of date, but was practically worn out. The capacity of the works at present was one million cubic feet per day; and with the demand for gas growing rapidly, it would be necessary in the near future to reconstruct the whole carbonizing plant, apart altogether from the renewals now proposed. The Gas Committee, after inspecting several modern gas-works, had decided to adopt the horizontal type of retort, ten in each bed, with a capacity of 15 cwt. of coal per retort. The present scheme would apply to one-half of the carbonizing plant, and would produce 1½ million c.ft. per day. With the improved type of plant they would have more than double the output from the existing retort-house.

Mr. C. P. MARKHAM (Chairman of the Staveley Coal and Iron Company, Ltd.) opposed the application. He said he had been a member of the Chesterfield Corporation for many years, and had also been Chairman of the gas undertaking. On behalf of the Staveley Company, Mr. Markham said he was prepared to supply the Corporation with all the gas they wanted from the 250 coke-ovens at the Staveley works; the distance from Staveley to the nearest gasholder at Whittington being 3½ miles. He urged that this was not the time for the municipality to spend a huge sum of money for the sake of increasing the make of gas when there was an enormous quantity available at the Staveley works. The Corporation, said Mr. Markham, were already taking coke-oven gas from Grassmoor, at a cost of 1s. to 1s. 2d. per 1000 c.ft.; and he asserted that they would be able to buy Staveley gas at about 1s. The Corporation could not make it for anything like that figure.

Mr. DAVIES said he believed the idea of Mr. Markham was to convey coke-oven gas to the Whittington works of the Corporation, which were comparatively small, producing only 300,000 c.ft. per day. If the Staveley supply was accepted, the Gas Committee would have to provide increased storage accommodation at the Whittington Works; and there were, he urged, other difficulties in the way of taking coke-oven gas in bulk, for which an expenditure of about £30,000 would be involved. With a modern carbonizing plant, he thought it would be possible to reduce the cost of production at the central municipal gas-works to less than 1s. per 1000 c.ft.

The MAYOR pointed out that the present charge for gas supplied by the Chesterfield Corporation was 3s. 2d. per 1000 c.ft. for lighting and 2s. 9d. for heating.

Mr. S. WALKER, on behalf of the Corporation, mentioned that the Staveley works were outside the limits of the Chesterfield gas supply, and that statutory powers would be required to lay the mains.

After closing the inquiry, the Inspector visited the municipal gas-works.

PADIHAM GAS DEPARTMENT.

The fifth annual report of Mr. A. F. Ames, the Engineer and Manager of the Padiham Urban District Gas Department, shows that the increase in gas sold, as compared with the previous year, was 6,085,000 c.ft—or 3·4 p.ct. The gas made during the year averaged 14,062 c.ft. per ton of coal carbonized, as against 13,258 c.ft.; and the quality supplied averaged 500 B.Th U. During the year a spiral-guided gasholder and steel tank have been erected. The capacity of the holder is 250,000 c.ft., bringing the total storage to 600,000 c.ft.; this being well above the maximum day's consumption. The net cost of coal, after deducting receipts from residuals, was 11s. 1d. per ton, as compared with 20s. 1d. last year. The receipts from residuals were equal to 18s. 6d. on the cost of the coal into store, as against £1 2s. 7d. The income from the sale of tar shows an increase of £907, and that from ammonium sulphate £370.

The numbers of cookers in use (being the property of the Council) are 1107 and 54 respectively. The showroom sales show an increase of 80 appliances over the previous year. The gas consumed in public lamps was 5,624,875 c.ft. During the year, pressure-wave controllers were replaced with Gunning's clockwork controllers. The latter method of controlling the lighting has given every satisfaction. The revenue expenditure and income during the year were £27,433 and £34,582 respectively, leaving a gross profit of £7148. Interest on loans and sinking fund contributions absorb £3436, leaving a net profit of £3712, as compared with £233 last year. A further reduction of 6d. per 1000 c.ft. in the price of gas from April 1 will mean a decrease in revenue during the coming year of £2700. The reduction during the past twelve months has been equal to 1s. 6d. per 1000 c.ft.—or a saving to the consumers of £8000 per annum. The present prices of gas vary from 17 to 23 p.ct. over pre-war prices; and considering that coal, wages, and materials are still 80 to 100 p.ct. over pre-war costs, these must be deemed very reasonable.

Irish Gas Prices.—The price of gas in Lurgan has been reduced from 5s. 3d. to 4s. 6d. per 1000 c.ft., with a further reduction of 10 p.ct. for power. In Dungannon the price of gas has been reduced from 9s. 2d. to 8s. 4d. per 1000 c.ft. In each instance, the reduction takes effect as from Oct. 1.

Gas Price Reduction at Rotherham.—At a meeting of the Rotherham Borough Council last week, mention was made of the proposed reduction in the price of gas of 1d. per therm—equivalent to 5d. per 1000 c.ft. This meant a loss to the department of £3900 for the half-year; but it was hoped that within the next twelve months it would be possible to make a further reduction.

TRADE NOTES.

Multiple Coin-Exchange Machine.

Messrs. S. H. Flood & Co., Ltd., of No. 103, Cannon Street, E.C. 4, have been appointed the sole selling agents of the "Fulprufe" multiple coin-exchange machine for prepayment meters.

Messrs. Meldrums, Limited.

What may be regarded as a bright spot in a gloomy engineering outlook is provided in information received from Messrs. Meldrums, Limited, of Timperley, near Manchester, which shows that during last month many converts to the cause of the crusade against the smoke evil and waste of fuel have been made. In all, twenty-nine forced-draught furnaces have been installed in various works, including gas-works. Four gas washer-scrubbers for coke-oven plant, and four destructors have also been erected in the period named.

Messrs. Best and Lloyd, Limited.

A new development in gas lighting has been marked by the introduction of the "Best" quick-grip fittings and bowls for attachment to the inverted burner. The complete fitment consists of a three-prong carrier which attaches to the burner, and a bowl which is supplied in two shapes, two sizes, and five varieties of glass. The bowl diffuses a cheerful brightness throughout the room, without impairing the efficiency of the light. Once fitted to a burner there is no more trouble with screws, for the bowl can be detached or replaced instantaneously. It is extremely light, being no heavier than the ordinary globe. Full particulars of this invention can be obtained from Messrs. Best and Lloyd, Limited, Cambray Works, Handsworth, Birmingham.

The Art of Sawing Metals.

An interesting booklet, and a series of photographs, have reached us from Messrs. Edward G. Herbert, Limited, of Levenshulme, Manchester, describing and illustrating the "Rapidor" way of sawing metals. By this method it is claimed that double the output from the machine and six to ten times the output per blade used can be obtained at one-half the cost per piece sawn. This is the result of a combination of three improvements—the "Rapidor" hack-saw blade, made of finest high-speed steel, and having a set which enables it to be re-sharpened many times; the "Rapidor" saw-sharpening machine, which provides a simple and quick method, and ensures that the teeth are ground to the most efficient angles; and the "Rapidor" sawing machine, which is specially adapted to run at a high speed and under the severe conditions required to get the full benefit of high-speed steel blades.

Mr. E. Bailey, who for the last five years has held the position of Distribution Superintendent to the Newark Gas Company, has been appointed Gas Sales Superintendent to the Spenborough undertaking.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Oct. 8.*

The London pitch market is stronger, there being more inquiry for export, and the price may be put at 132s. 6d. to 135s.; but there do not appear to be any urgent sellers. It is understood that stocks are lower than usual at this time of the year, in consequence of the large quantities of tar that were used on the roads—in fact, there is still a demand for tar for this purpose. Creosote is worth about 9¾d. to 10d. net per gallon in bulk at maker's works. Benzoles, &c., are unchanged. The value of 60's carbolic acid is 3s. 4½d. to 3s. 6d. net.

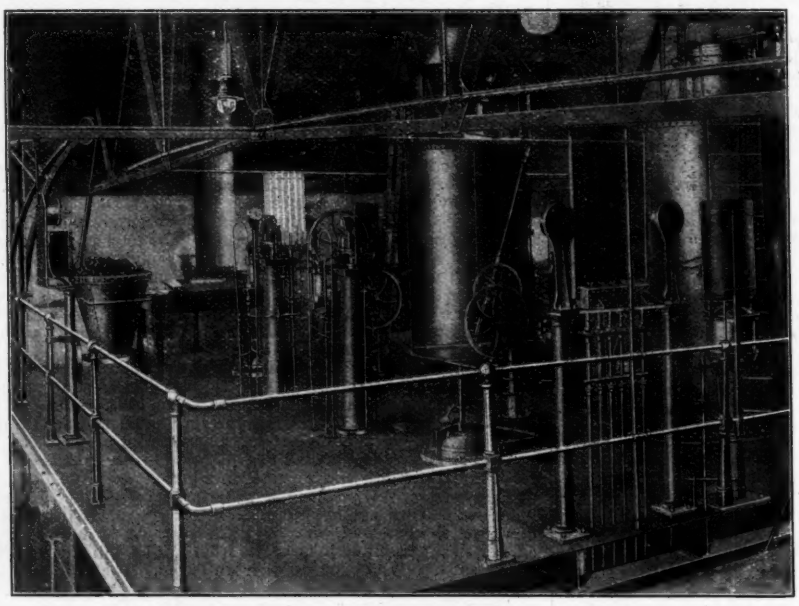
Tar Products in the Provinces.

Oct. 8.

There has been an improvement in the market for pitch during the past week, and considerable business is reported at the enhanced price. Creosote remains steady, and there is a fair amount of demand for products and quantity.

The average values for gas-works products during last week were: Gas-works coal tar, 76s. to 81s. Pitch, East Coast, 130s. to 132s. 6d. f.o.b. West Coast—Manchester, 126s. to 127s. 6d.; Liverpool, 127s. to 129s. 6d.; Clyde, 128s. to 130s. Benzole 90 p.ct., North, 1s. 2½d. to 1s. 3½d.; crude 65 p.ct. at 120° C., 10d. to 10½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 5d. to 1s. 7d. Toluole, naked, North, 1s. 7d. to 1s. 8d. nominal. Coal tar crude naphtha in bulk, North, 8d. to 8¼d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 4d. Heavy naphtha, North, 1s. 5½d. to 1s. 7½d. Creosote, in bulk, North, liquid, 8d. to 8¼d.; salty, 7½d. to 8d.; Scotland, 6¾d. to 7½d. Heavy oils, in bulk, North, 8¼d. to 9d. Carbolic acid, 60 p.ct., 3s. 4d. to 3s. 5d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Stockton and the Yarm Gas-Works.—To the Stockton-on-Tees Corporation on Tuesday of last week, the Town Clerk reported that an agreement, subject to the consent of the Board of Trade, had been made between the Yarm Gas Company and the Corporation, for the purchase of the former's undertaking. The Gas Committee had decided to retain the services of Mr. Kiddle, who had been in the Company's employ, at a standing wage of £3 3s. per week, with free house, &c. The Preston Parish Council asked if, under the new Order arising out of the purchase, the Corporation intended the charge for gas in Eaglescliffe and Preston to be the same as in Wolviston and Billington, which would mean an increase to the two first-named parishes. The Council decided to refer the question of the price of gas to outside districts to a special Sub-Committee.



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THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The market trend during the past week has been distinctly firm. Not only has the better feeling of the last week or two been maintained, but collieries, finding there is trade enough to keep them going full time, are more than ever inclined to hold out for their prices, and, if anything, increase them.

It is not easy to assign any particular cause to the present strength of the market, unless it be seasonal demand. Since the lull in the market which set in approximately with the second half-year, buyers have been continually holding-off, always hoping for still further falls in prices. Now that the winter season is fast approaching, contractors, who have in many cases been postponing shipment as far as they could, are more and more coming along for their regular quantities. The result is that collieries, who in most instances are well sold up to the end of the year (at any rate on paper), have very little spare coal to sell, and feel justified in holding out for good prices.

The current market rate for specials and best gas is fully 24s. to 24s. 6d. f.o.b., and 22s. to 23s. for seconds. Though these prices are no great advance on last week's quotations, there is much more chance of getting them than there was. Coking and steams are distinctly firmer than they were a week ago.

Encouraged by the fact that the market remains so firm for no very specific and obvious reason, collieries are more than ever inclined to be optimistic about the future, and to quote not less than to-day's prices for forward. The consequence is that very little new business has been fixed up for next year. Buyers' ideas still do not run to much more than 21s. to 22s.; but indications are not lacking that they are viewing the situation rather more seriously, and a good deal of inquiry is constantly coming along.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

Gas coal in Yorkshire and Lancashire is naturally firm, owing to the time of the year and the fact that some of the consuming concerns have made their purchases well into next year. There are only a few that are not yet fully contracted.

The recent rush for local household supplies has been steadied by advances from 1s. to 3s. per ton made by the various supplying collieries; and there does not seem to be any indication of uniform advancement to give examples to the trade as to how prices will be affected during the next few months. There is, as before, a good demand for the better grades of household fuel; while the secondary descriptions remain firm.

There is no improvement in the industrial consuming areas, and the outlook in the engineering and textile trades in particular is rather black. At all events, it appears as though the situation in the nearer European countries will be the eventual solution; but even if there is a settlement of the Ruhr question, it will take some months before this country has the benefit in regard to employment and the subsequent development of the essential trades of the country.

The shipping situation changes from day to day; but Germany continues to buy coal and to pay sterling in London for delivery. The high rates of exchange in respect of France and Belgium are causing those countries some concern, although there is a more optimistic view prevailing among Government authorities in regard to a settlement of the nearer European financial situation.

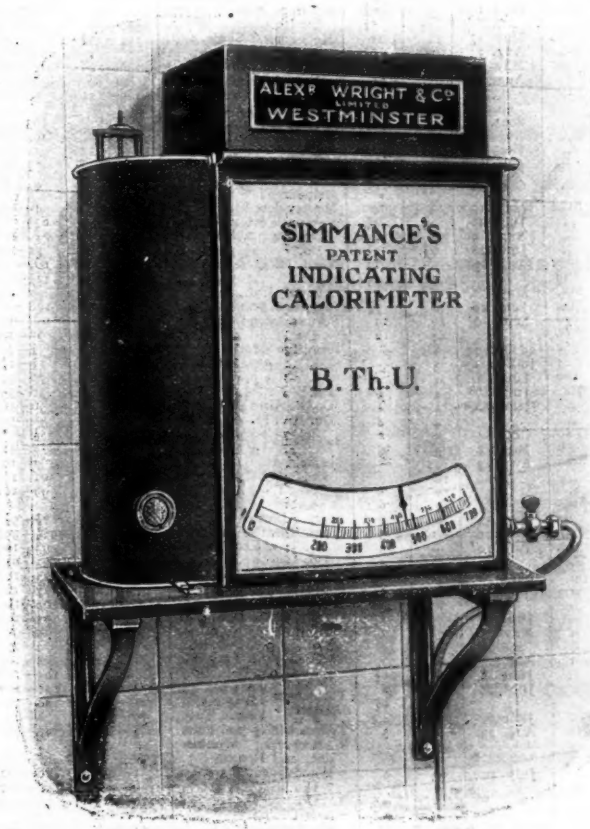
COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The outlook is regarded with misgiving. Industry generally is operating so far below productive capacity that the market for steam coals and works fuel of all sorts is weak and precarious. Whatever signs there are of reinvigoration are very nebulous. While expectations of a settlement of the boilermakers' dispute have had a slight quickening effect in some branches of the finished iron and steel trade, there is no expansion of demand for pig iron. Furnaces which have been closed down to ease the market of accumulated stocks are not likely to be restarted till the position has radically changed. The concession made this month by the coke-ovens has had no recuperative effect. It has been evident for some time that the drying-up of demand was due to causes deeper than the question of cost. There would appear to be considerable stringency still in the coke market. Smelters say that if their claims are to be subordinated to those of the foreigner, the reduction to 24s. is bound to be illusory in prevailing conditions. Endeavours to get quick supplies at the new price (24s. at ovens) have not always been successful since the month opened. Gas coke has advanced by 2s. 6d. Collieries that had not previously instituted winter prices for house coal have now done so. This is the only means the industry has of recouping itself for losses in other directions. Unfortunately, the adjustment is very unequal in its incidence. Thanks to the improved demand for gas coal during the past month or so, and the livelier state of the domestic trade, the soft pits are able to make a full output. Others are working only irregularly.

Good Results at Blackburn.—The manufacture of gas in Blackburn has increased by a third in the last nineteen years; 605,917,000 c.ft. being manufactured in 1904, against 910,382,000 c.ft. in the year just ended. Of the latter quantity, 803,691,100 c.ft. was last year sold to private consumers. A return by the Blackburn Borough Treasurer shows an income on the gas undertaking of £226,202, and an expenditure of £209,606, leaving a balance profit of £16,596. The profit on the department has met a deficiency brought forward; and a balance is carried forward.

CALORIFIC POWER AT A GLANCE.



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STOCK MARKET REPORT.

THE uncertain political outlook had a depressing effect on the Stock Exchange last week. Attempts were made to infuse life into the markets; but these lacked confidence, with the result that very little business was done. Russian and German Bonds were again in demand at the beginning of the week, which indicates that the "speculators" at least anticipate that the respective Governments will eventually admit and pay the interest thereon. The appearance of the Commonwealth Government's prospectus for the £7,500,000 Loan, following on the Victorian issue of £9,000,000, naturally affected prices; and the latter security at one time was marked down to ½ below the price of issue, but improved to ¼ premium at the end of the week.

On Friday, a more cheerful tone prevailed. Investment buying was sufficiently active to cause a general hardening in most of the markets, more particularly in the case of gilt-edged securities.

A feature of the Foreign Market was the recovery in Chinese Bonds. The 4½ p.ct. of 1898 reached a figure of 79½.

It will interest investors in gas stocks to know that it is possible that the London Electrical Companies may adopt the sliding-scale principle in respect of charges for electricity and rates of dividends which has worked so well, excepting perhaps during the war period, in the case of gas companies.

The gas companies' quotations which showed variations were as follows: Alliance and Dublin (*ex* div.), British "A," Continental Union, Gas Light ordinary, Metropolitan of Melbourne (*ex* div.), Primitiva 5 p.ct. preference, and San Paulo 6 p.ct. preference (*ex* div.) depreciated slightly; but Tottenham "A" rose two points.

The following transactions were recorded during the week: On Monday, Commercial 3½ p.ct. 95½, Continental Union 33, Gas Light and Coke 4 p.ct. 97, 4 p.ct. consolidated preference 81½, Hastings and St. Leonards 3½ p.ct. 80, 80½ *ex* div., Imperial Continental capital 158, South Metropolitan 98¼, 98⅜, 98½, 99, 99⅛, South Suburban 5 p.ct. 101½, 5 p.ct. debenture 99, Tottenham "A" 5 p.ct. 125, Barnet "D" 110½, Brighton and Hove 6 p.ct. "B" preference 106½, 107, British Gas Light "B" 12⅞, "Hull" 3½ p.ct. mortgage debenture 66, Peterborough 109½, 110. On Tuesday, Brentford "A" 102, 102½, 103, Gas Light and Coke 4 p.ct. 96¼, 96½, 96⅝, 97, 3½ p.ct. maximum 66, 3 p.ct. debenture 62½, Hastings and St. Leonards 3½ p.ct. 80, 80½ *ex* div., Primitiva 6s., 5 p.ct. preference 28s. 6d., 29s., 30s., 4 p.ct. (River Plate) debenture 56½, South Metropolitan 98, 98½, 99, Tottenham "B" 103, 103½, Wandsworth "B" 3½ p.ct. 115, 5 p.ct. (Wimbledon) 115, Barnet "D" 111, British Gas Light "B" 12 7/16, Hull 3½ p.ct. mortgage debenture 65½, Mid-Kent 39s. On Wednesday, Alliance and Dublin 4 p.ct. debenture 66⅝, Brentford "A" 4 p.ct. 103, British "A" 12⅝, Cape Town 4½ p.ct. 1st mortgage debenture 77, Commercial 3½ p.ct. capital 96½, European 8⅝, Gas Light and Coke 4 p.ct. 96½, 97, Imperial Continental 3½ p.ct. debenture 76½, Liverpool 7 p.ct. preference 105½ *ex* div., Primitiva 5 p.ct. preference 30s., South Metropolitan 98⅝, 98½, 99, South Suburban 5 p.ct. 101½, 102½, Croydon 7 p.ct. debenture 104, 105, Wandsworth 3½ p.ct. New, 101, 102½, 103. On Thursday, Brentford "B" 102½, Commercial 3½ p.ct. 96½, Gas Light and Coke 4 p.ct. 96, 96½, 96⅝, 97, Hastings and St. Leonards 3½ p.ct. 82, Imperial Continental 158, 159, Primitiva 6s., 5 p.ct. preference 29s., South Metropolitan 98⅝, 99, Hartlepool 5 p.ct. maximum 87. On Friday, Bournemouth "B" 7 p.ct. maximum 12½, Brentford "A" 4 p.ct. 102½, Cardiff 7½ p.ct. debenture 110 7/16, 110½, Continental Union 32, Gas Light and Coke 95½, 96, 96½, 96¾, 96⅞, 3½ p.ct. maximum 66, 66⅔, 4 p.ct. preference 82, 3 p.ct. debenture 62½, Hastings and St. Leonards 3½ p.ct. 82½, Imperial Continental 158, 3½ p.ct. debenture 76½, 77, Primitiva 7s., South Metropolitan 98, 98½, 98⅝, 99, 99⅛, South Suburban 5 p.ct. 102½, Barnet "A" 156½, 156½, Hartlepool 5 p.ct. maximum 88, Southend 5 p.ct. original 90½, 91, 5 p.ct. new "B" 90½, 91, Wymondham 57s. 6d.

In the Foreign Exchange market depression was also the rule, the position in Germany affecting allied currencies. A satisfactory feature, however, was the rise in sterling at the end of the week, when French francs also improved and Belgian fxancs moved in sympathy.

There was ample credit in the Money Market, and loans from day to day were freely offered at 2 p.ct.

There was some activity in the silver market; the price closing 31⅜d. per oz., or ⅛ higher than the previous week.

The Bank of England rate remains at 4 p.ct., to which figure it was raised from 3 p.ct. on July 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Present Quotations.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.	Aldershot 5 p.c. max. C.	..	72—77	...
131,978	Stk.	Aug. 9	—	5	Do. 4 p.c. Pref.	..	70—75	...
217,902	,,	Oct. 4	4	4	Alliance & Dublin Ord.	59—64	70—75*	...
1,551,868	,,	July 12	4½	5	Do. 4 p.c. Deb.	76—79	62—67	66½
574,000	,,	May 17	4	4	Bombay, Ltd.	5⅞—6⅛	5⅜—5¾	...
280,000	5	,,	7½	8	Bournemouth Gas and Water { B 7 p.c.	15—15½	11½—12½	12½
100,000	10	Aug. 9	16	8	Pref. 6 p.c.	13½—14	11½—12½	...
383,110	10	,,	7	7	4 p.c. Deb.	..	10½—11¼	...
115,000	10	,,	6	6	Brentford A Consolid.	261—266	77—82	...
162,025	—	June 28	—	—	Do. B New	204—209	100—105	102—103
992,045	Stk.	July 12	14	6 7/10	Do. 5 p.c. Pref.	109—111	100—105	102½
734,920	,,	,,	11	6½	Do. 4 p.c. Deb.	91—93	83—88	...
55,000	,,	,,	5	5	Brighton & Hove Orig.	208—213	77—82	...
221,400	,,	June 14	4	4	Do. A Ord. Stk.	154—159	171—176	...
214,745	,,	Aug. 23	11	11½	Bristol 5 p.c. max.	..	127—132	...
244,200	,,	,,	8	8½	British A Ord.	44—45	95—96	...
1,287,500	Stk.	July 26	5	5	Do. 7 p.c. Pref.	..	121—131*	...
570,000	20	Oct. 4	12½	10	Do. 4 p.c. Deb. Stk.	88—90	11½—12½	...
100,000	10	June 28	—	7	Cape Town & Dis., Ltd.	2½—2¾	75—80	...
120,000	Stk.	,,	4	4	Do. 4½ p.c. Pref.	4—6	6½—7½	...
100,000	10	May 17	—	7	Do. 4½ p.c. Deb. Stk.	70—75	6—7	...
100,000	10	May 3	—	4½	Cardiff 7½ p.c. Deb.	..	75—80	77
150,000	Stk.	June 28	4½	7½	Chester 5 p.c. Ord.	108—110	106—111	110 7/16—110½
237,860	,,	,,	—	5	Commercial 4 p.c. Stk.	106—108	..	...
157,130	,,	Feb. 26	5	5	Do. 3½ p.c. do.	103—105	95—98	...
1,513,280	,,	July 26	5/9/4	6	Do. 3½ p.c. Deb. Stk.	69½—71½	91—98	...
560,000	,,	,,	5½	6	Continental Union, Ltd.	76—79	60—64	...
475,000	,,	June 14	3	3	Do. 7 p.c. Pref.	115—118	32—37	...
800,000	,,	14 Jan. 15	4	—	Croydon sliding scale.	..	72—77	...
200,000	,,	Dec. 14	7	4	Do. max. div.	..	101—104	...
660,000	,,	Aug. 9	—	6½	Derby Con. Stk.	123—125	81—85	...
284,975	Stk.	,,	6	5	Do. Deb. Stk.	102—104	..	...
492,270	,,	—	—	4½	East Hull 5 p.c. max.	..	..	8½
55,000	,,	—	4	4	European, Ltd.	17½—18	8—9	...
209,000	,,	Oct. 4	—	5	Gas Light and Coke	98—102	95¾—97½	95⅞—97
1,002,180	10	July 12	10	5		76—79	65—68	66—66½
16,546,180	Stk.	July 26	4/17/4	5½		96—99	80—83	81½—82
2,600,000	,,	,,	3½	3½		72½—74½	61—64	62½—62½
4,062,235	,,	,,	4	4		..	..	...
4,761,930	,,	June 14	3	3		..	..	...
130,000	,,	Dec. 11	10	10		..	93—98	...
42,000	—	—	—	7½		..	78—83	80—82½
82,500	,,	Sept. 19	5	6⅛		87—89	15—16	...
258,740	,,	,,	5	5½		16½—16¾	144—149	...
70,000	10	May 17	3½	10		..	158—163	158—159
86,600	Stk.	Aug. 23	11	9½		150—160	76—78	76½—77
1,976,000	,,	May 31	9	17		84—86	95—100	...
401,400	,,	Aug. 9	9	3½		119—121	..	...
235,242	,,	,,	3½	6½		..	103—106	105½xd.
2,127,240	,,	Feb. 26	6½	5½		..	104—109	...
600,000	,,	Sept. 19	10	7		..	52—57	...
165,736	,,	Aug. 23	—	9		..	3½—4	...
63,480	,,	June 28	7/5/6	—		4½—4¾	95—98*	...
75,000	5	June 14	6	7		99—101	49—54	...
50,000	100	Oct. 1	4½	4½		11½—12	83½—84½	...
341,920	Stk.	May 17	4	4		98½—99½	74¼—70½	...
1,875,892	,,	July 26	4½	4½		..	71—73	...
250,166	,,	Aug. 9	—	4		82—83	16½—17½	...
329,705	,,	June 28	3½	3½		..	11½—12½	...
15,000	10	Aug. 23	11	11		14—15	97—102	...
75,940	Stk.	,,	7/14/0	7 7/10		117—122	108—113	...
300,000	Stk.	May 3	8	7		..	100—105	...
138,120	50	June 28	—	7½		128—131	97—102	6/—7/-
60,000	50	Sept. 6	13	13		113—121	½—⅞	28/6—30/-
100,000	5	,,	12	12		5½—6	1¼—1½	...
1,450,345	5	29 Oct. 14	8	—		4½—5	70—74	...
2,499,800	100	30 Dec. 15	5	5		91—93	56—59	...
341,400	Stk.	June 1	4	4		..	56—59	56½
600,000	,,	July 26	4	4		85—87	56—59	...
220,335	,,	June 28	4	4		85—87	5¼—6*	...
321,670	10	,,	4	6		10½—11	38—41	...
150,000	50	Oct. 4	6	5	San Paulo { 6 p.c. Pref.	47—49	102—104	...
125,000	Stk.	July 2	5	5	{ 5 p.c. Deb.	223—224	101—103	...
270,000	,,	Aug. 23	10	5	Sheffield A	222—224	99—101	...
419,968	,,	,,	10	4	Do. B	220—222	..	...
1,047,000	Stk.	—	—	6	Do. C	..	7½—9½	...
133,201	10	May 31	9	9	Shrewsbury 5 p.c.	10½—11½	97½—99½	98—99½
90,000	Stk.	July 26	5/9/4	5	South African	111—113	98—100	...
6,609,895	,,	July 12	—	5	South Met. Ord.	..	61—64	...
250,000	,,	,,	3	3	Do. Red. Pref.	72½—74½	105—107	...
1,895,445	,,	Sept. 6	6½	6½	Do. 3 p.c. Deb.	..	127—129	...
734,000	,,	Aug. 23	8½	8½	Do. 6½ p.c. Deb.	137—139	100—103	101½—102½
91,500	,,	,,	6	6	South Shields Con. Stk.	114—116	95—100	103—103½
1,087,795	,,	June 28	5	5	S'th Suburb'n Ord. 5 p.c.	110—118	88—91	...
368,837	,,	May 3	5	7	Do. 5 p.c. Deb. Stk.	99—102	72—77	...
647,740	,,	June 28	4	4	S'th'mpt'n Ord. 5 p.c. max	..	102—104	...
121,275	,,	Aug. 23	—	7	Do. 4 p.c. Deb. Stk.	..	105—107	...
250,000	,,	June 28	—	6½	Swansea 7 p.c. Pref. Stk.	..	122—127	125
200,000	,,	July 26	6	8	Do. 6½ p.c. Deb. Stk.	135—138	100—105	103—103½
120,000	,,	,,	6	6½	Tottenham { A 5 p.c.	115—117	78—82	...
782,275	,,	June 14	4	4	District { B 3½ p.c.	87—89	88—90	...
181,255	Stk.	Aug. 23	3	5	{ 4 p.c. Deb.	108½—109	..	...
258,251	,,	,,	,,	,,	Tynemouth 5 p.c. max.	..	126—131	...
30,000	,,	July 12	8½	9	Wandsworth, Wimbledon, and Epsom—	131—136	112—117	115
255,636	,,	,,	6½	7½	Wandsworth A 5 p.c.	129—134	98—103	101—103
108,075	,,	,,	5/17/3	6 7/10	Do. B 3½ p.c.	110—115	..	113
140,865	,,	,,	—	6½	Do. C.	..	109—114	...
352,000	,,	,,	6½	7½	New Ordinary	117—122	112—117	...
98,000	,,	,,	6½	7½	Wimbledon 5 p.c.	121—126	57—60	...
88,416	,,	June 28	3	3	Epsom 5 p.c.	66—69		
					3 p.c Deb. Stk.			

* Ex. div.

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Prospectus and Form of Tender (which latter must be sent in by 11 o'clock on Friday, October 19) may be obtained of MESSRS. A. & W. RICHARDS, 37 WALBROOK, E.C. 4.

New Company Registered.—A Company with the title of Jones & Hast (Gas-Burners) has been registered, with a capital of £1050, to adopt an agreement with Messrs. R. H. E. Jones and C. A. Hast for the acquisition of a licence to make and sell inventions in relation to gas burners, apparatus, and fittings. The Directors are Messrs. A. E. Podmore, T. J. Wilson, R. H. E. Jones, and C. A. Hast; and the offices are at No. 85, Farringdon Street, E.C.

Reduction at Bilston.—The Bilston Gas Light and Coke Company announce that, as from the reading of the meters for the September quarter, the price of gas will be reduced as follows: For lighting and domestic purposes, from 10 66d. to 10d. per therm. For manufacturing purposes: Under 450 therms per quarter, from 10·66d. to 10d. per therm; over 450 therms per quarter, from 10·22d. to 8·88d. per therm; over 900 therms per quarter, from 9·33d. to 7·33d. per therm.

Keighley Gas Price Reduced.—As foreshadowed recently, following on the satisfactory profit on the Keighley Corporation gas undertaking, the price of gas has been lowered; the Town Council last week having approved of the Committee's recommendation of a reduction of 3d. per 1000 c.ft. as from Jan. 1, which brings the price down to 2s. 11d. gross, or 2s. 9¼d. net—a figure that compares very well with the prices in surrounding towns. The Chairman (Mr. W. H. Murgatroyd), the Committee, and the Engineer and staff were congratulated by a number of speakers at the Council meeting.

Two Brave Co-Partners.—Under this heading, the October issue of the "Co-Partnership Journal" of the South Metropolitan Gas Company has the following: On the sea front at St. Leonards, there was an exciting scene a few weeks ago, in which four persons had narrow escapes from being drowned; two of those involved being co-partners. A young lady entered the rough sea to bathe; and it was soon apparent to people on the beach and promenade that she was in serious difficulties. A Hastings man entered the water, and endeavoured to rescue her, but was himself overcome. Then Mr. Robert Nash, of Peckham, who was fully dressed, went in and succeeded, after much trouble, in rescuing the lady. The Hastings man was still in difficulties; and Mr. George Freeman, another co-partner, went to his aid, and by the help of a police constable managed to get him ashore. Mr. Nash had to have artificial respiration applied. The rescues were witnessed by hundreds of people on the sea front. Both the rescuers are engaged in the Old Kent Road workshops (stove and lacquering department). A presentation of silver cigarette cases has been made to them by their co-partners.

Amalgamation Prospect at Blackpool.—At a gas inquiry at Poulton-le-Fylde, on Oct. 4, it was pointed out that there were prospects of amalgamation with Blackpool; and it was also mentioned that Blackpool could supply gas at 33 p.ct. cheaper. Councillor R. P. Tomlinson said they hoped to produce gas at a cheaper rate, and that the undertaking would be self-supporting. In July this year, the erection of a retort-house was commenced. The Clerk said the gas undertaking was acquired by the Council in 1901 from the Poulton Gas, Coal, Lime, and Coke Company, after being in existence for over fifty years. Little had been done in renewals and repairs. The storage capacity was entirely inadequate, and the plant required renovation and renewals. The percentage of leakage was 13·7; and it was estimated that if this could be reduced to 7 p.ct., £420 a year would be saved. They were also looking forward to developments. The sum of £3000 would be spent on a gasholder, £1000 on retorts, and £3571 on replacements and extensions; leaving the sum of £1500 for capital. The Gas Manager quoted statistics to show that the output of gas had doubled since 1913. Mr. J. Waddington (Poulton Ratepayers' Association) also opposed the application.

Gas Poisoning.—Mrs. Maynard, of Goring-on-Thames, has met with a tragic end. She placed her kettle on a gas-ring preparatory to making tea on Friday morning, and when about to light the gas with a match fell forward, striking her head against the gas-ring. She fell to the ground unconscious, leaving the gas-jet unlighted; and her death was brought about by gas poisoning. A verdict of accidental death was returned at the inquest.

An Altercation about Costs.—In the Mayor's and City of London Court, on Sept. 27, before his Honour Judge Shewell Cooper, Mr. Alfred Defries, trading as D. Defries and Son, plumbers, of Houndsditch, claimed from Mr. H. Sherman, of Aldgate, £7 10s., the balance of an account for £12 10s. for work done. In November last the plaintiff was asked to run a gas supply to defendant's billiard room. To do this 100 ft. of gas-piping were required, and the work took more than a week. The defendant said that the £5 which he had paid was more than sufficient. His Honour found for the plaintiff, with costs.

Leeds Corporation Gas Exhibit.—On p. 68 of last week's "JOURNAL," reference was made to the excellent gas lighting arranged by the Corporation at the International Fisheries Exhibition in Leeds, but by mistake this was attributed largely to the use of high-pressure gas. In view of the results attained, it is very gratifying to learn from Mr. C. S. Shapley (the Engineer and General Manager) that the splendid lighting was secured solely with low-pressure gas. So good, indeed, was the lighting that as a result of it many concerns have adopted gas in place of electricity as an illuminant. These concerns include one large drapery establishment in the city—for both window and inside lighting.

Neath and the National Gas Exhibition.—Considerable consternation was broadcasted among the people of Neath, writes a local correspondent, by reason of the fact that a number of employees of the municipal gas-works had been deputed to attend the National Gas Exhibition at Birmingham. The Mayor strongly blocked in Council the recommendation of the Gas Committee, which was to the effect that the Gas Manager (Mr. W. C. Jackson), four members of the Committee, and twelve employees at the works attend the exhibition. The recommendation of the Committee was, however, carried by a good majority; it being urged that the trip would be an education for the men concerned. The ratepayers agree; but argue that it was altogether too expensive a course.

Barnsley Coalite Plant.—The "Financial Times" understands that the coalite plant at Barugh, near Barnsley, is now to be considerably extended. The present plant consists of one battery of retorts, with a capacity of 30 to 35 tons of coal per 24 hours (equivalent to a production of 21 to 24½ tons of coalite) but including also a very large bye-product plant capable of handling the yield of gas, motor spirit, and fuel oil from 200 tons of coal. The recent successful two years' running has, adds our contemporary, convinced those in authority that the time has now arrived for a very decided step forward in the direction of supplying smokeless fuel on a wholesale scale. Consequently, the plant at Barnsley is to be enlarged immediately, so as to be capable of handling 500 tons of coal per 24 hours—that is, equivalent to the production of 350 tons of smokeless coalite, 1500 gallons of motor spirit, 9000 gallons of fuel oil, and 3 tons of sulphate of ammonia in this time. Also, it is the intention to proceed with the erection of similar 500-ton plants in different industrial centres, in order to supply surrounding localities and keep down the cost of carriage. With the present plant at Barnsley, it is said, detailed records of the actual carbonization of 8280 tons of coal have shown a yield of 6210 tons of coalite, 172,565 gallons of tar oils, and over 38,000,000 c.ft. of rich gas.

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